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THESIS

EFFECT OF DEREGULATION IN THE TELECOMMUNICATIONS INDUSTRY ON MILITARY BASE TELEPHONE COMMUNICATIONS

by

Philip Raymond Flowers

March 1983

Thesis Advisor: Daniel C. Boger

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SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* EFFECT OF DEREGULATION IN THE TELECOMMUNICATIONS INDUSTRY ON MILITARY BASE TELEPHONE COMMUNICATIONS		5. TYPE OF REPORT & PERIOD COVERED Master's Thesis March 1983
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Philip Raymond Flowers		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Postgraduate School Monterey, California 93940		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Postgraduate School Monterey, California 93940		12. REPORT DATE March 1983
		13. NUMBER OF PAGES 153
14. MONITORING AGENCY NAME & ADDRESS *(if different from Controlling Office)*		15. SECURITY CLASS. *(of this report)*
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for Public Release, Distribution Unlimited

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Telephone, Telephone Industry Deregulation,
Military Base Telephone Systems

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

The telecommunications industry in the United States has recently been undergoing a period of rapid change. To enhance the administrative capabilities of base personnel and to obtain the most cost-effective telephone equipment and services, the

military base commander must understand the events which have shaped today's telecommunications industry, appreciate the options which are becoming available, and insist that the base telephone officer practice the sound management techniques of a telecommunications manager in acquisition and management of the base telephone system.

In furtherance of these objectives, this thesis presents a brief historical survey of the industry concentrating upon recent developments, and presents a paradigm for management, operations, and analysis of military base telephone communications.

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Effect of Deregulation in the Telecommunications Industry on Military Base Telephone Communications

by

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Lieutenant Commander, United States Navy
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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN TELECOMMUNICATIONS SYSTEMS MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
March 1983

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ABSTRACT

The telecommunications industry in the United States has recently been undergoing a period of rapid change. To enhance the administrative capabilities of base personnel and to obtain the most cost-effective telephone equipment and services, the military base commander must understand the events which have shaped today's telecommunications industry, appreciate the options which are becoming available, and insist that the base telephone officer practice the sound management techniques of a telecommunications manager in acquistiicn and management of the base telephone system.

In furtherance of these objectives, this thesis presents a brief historical survey of the industry, concentrating upon recent developments, and presents a paradigm for management, operations, and analysis of military base telephone communications.

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I. INTRODUCTION

A. THE TELEPHONE

In the latter half of the twentieth century, the telephone has become the symbol of the ability to achieve instantaneous communications among all the world's peoples, with the promise and the threat that such communications imply. Throughout the world, but particularly in the technologically advanced countries, trysts are made, fortunes are won and lost, and wars are averted in conversations transmitted over telephone networks. Nowhere is this situation truer than in the United States. The American Telephone and Telegraph Company rightly proclaims that the United States enjoys the best telephone system in the entire world. In this country alone, there are more than one hundred and seventy-five million telephone instruments.

Until recently, most of the telephones were the standard, rotary-dial black models found in nearly every home and office. These were simply taken for granted as was the service that they provided. Only when this service was lost--as it was after the major switchboard fire in New York City in 1975--did the ordinary user become aware of its presence and of the changes it had made in his or her way of life.

However, technological changes first made possible by the invention of the transistor at the Bell Laboratory in 1947 have begun to bring about dramatic changes in the telephone communications world. The black rotary-dial telephone is being rapidly replaced by pushbutton-dial instruments with which the user can talk to machines and computers, as well as with other humans. Phones with small transceiver

units, and car phone units, are bringing the worlds of telephony and radio closer together. Electromechanical switchgear is being replaced by electronic switches which are tantamount to computers.

Sophisticated users have become aware that telephone and similar type networks are valuable, not only for voice transmissions, but also for data transmissions into, out of, and between electronic computers. In fact, voice and data technologies are rapidly merging--modulating/demodulating devices (modems) convert the computer's digital signals into analog signals which can easily be transmitted along voice-grade telephone circuits, and signals generated by the human voice can easily be converted into digital pulses for transmission along paths originally developed for data transmission--so that voice and data transmissions today are often spoken of under the common rubric of telecommunications.[1]

B. THE TELECOMMUNICATIONS INDUSTRY IN THE UNITED STATES

1. American Telephone and Telegraph

To most Americans, telephone means American Telephone and Telegraph--the Bell System. American Telephone and Telegraph (AT&T) is the largest corporation in the world with assets in excess of one hundred billion dollars. It employs more than a million people, has more than three million stockholders who together own more than nine hundred million shares of stock, and it receives nearly eighty billion dollars in revenue each year from which it

---

[1] In this paper, the term telecommunications will refer predominantly to voice communications equipment and networks. However, unless evident from the context or explicitly stated, the discussion will be applicable to both voice and data transmission facilities and capabilities.

generates seven billion dollars in profits. AT&T does eighty percent of the telephone business in the United States and ninety-seven percent of the long-distance conversations in the country are transmitted over its networks. Five hundred and twenty-seven million conversations a day are conducted on its more than one hundred and forty-two million telephone instruments.

AT&T has followed what the students of business refer to as a defender strategy. The company is jealous of its position in the telecommunications industry and would like to seal off the portion of the market which it now serves to create a stable domain. To discourage competition it uses competitive pricing, high-quality products, and favorable government regulations. It has achieved a high degree of technological efficiency by vertical integration from manufacturing of equipment by its wholly owned subsidiary, Western Electric, to installation and repair of equipment connected to its network at the customer's home or office. As a defender, Bell's weaknesses lie in its lack of commitment to innovation, and its tendency to underestimate developments outside of its domain [Ref. 1]. It operates in an industry where barriers to entry by competing firms are very high, especially required capital outlays and technological know-how. Bell emphasizes the strengths of the firm, the values accrued by the size of its networks, the reliability of its service, and the efficiency of its operations. AT&T cultivates its maternalistic image--the benevolent Ma Bell.

2. Industry Prospects

The telecommunications industry in the United States has entered the final twenty years of the century enjoying an annual income in excess of ninety billion dollars with expectations of doubling this within the next five years.

In addition to this expected growth, the industry--despite the defender strategy employed by its dominant player--thrives in an environment of exciting technological innovation.

However, the industry is also undergoing a period of major structural change as a result of two recent events--the Federal Communications Commission's 1980 Computer Inquiry II Decision intended to reduce the hold which American Telephone and Telegraph's subsidiary, Western Electric, has on the telecommunications equipment market as well as to introduce new competition into the industry; and the January, 1982, Consent Agreement between American Telephone and Telegraph and the Department of Justice (DOJ) by which AT&T agreed to divest itself of ownership of its twenty-two local operating companies.

3. An Industry In Flux

The Computer Inquiry II Decision and the Consent Agreement will result in the end of American Telephone and Telegraph's vertical integration. However, at the very time that AT&T is making preparations to break up its vertically integrated company by divesting itself of its local exchange companies and restricting its telephone business to long distance networks, General Telephone and Electronics (GTE), the largest independent local telephone company, has begun its own vertical integration program by building a satellite network in order to enter into the long distance market in addition to the local telephone market where it now operates.

Other long distance carriers such as Graphic Scanning, MCI Communications Corporation and Western Union as of June, 1982, had applied for licenses to set up cellular, mobile car telephone networks that will eventually compete with local phone companies.

Merrill Lynch, the brokerage firm, is negotiating a joint venture with Western Union to build a telecommunications center in New York City that will put Merrill Lynch into competition with the common carriers.

Although opportunities for new entrants into the telecommunications industry in the 1980's are still limited by the relatively large capital requirements, Robert P Reuss, Chairman of CENTEL Corporation believes that, "Barriers to market entry have almost all disappeared." [Ref. 2: p. 60].

C. EFFECT UPON MILITARY COMMUNICATIONS

1. Military Base Communications

Military base commanders are acutely aware of the importance of telecommunications systems to the administrative efficiency with which base personnel are able to accomplish their jobs, and of the many hundreds and/or thousands of dollars spent each month on providing for and maintaining these services.

Until recently, acquiring non-mission critical telephone equipment and services has not proven to be a very difficult job. If new equipment and/or services were required, the communications officer would call the local telephone company or call AT&T directly and order what was required. The respective phone system would convert requirements into equipment and systems, install the systems, and send a bill--the rates all carefully spelled out in tariffs filed with the Federal Communications Commission (FCC) or with the state Public Utilities Commission. If the requirements exceeded the communications officer's one thousand dollar obligatory limit, he or she merely went to the next eschelon or to the Defense Commercial Communications Office at Scott Air Force Base in

Illinois, and these agencies would make the arrangements with the local telephone company or with AT&T.

If a telephone serving a particular base experienced a failure, the base communications officer would call the local phone company and log out the circuit. The appropriate phone company technicians would troubleshoot the circuit and the company's repairmen would effect the required repairs. When the circuit was again operational, the phone company representative would call the communications officer and advise him or her of the fact.

2. The Issues

This thesis will investigate the recent, major changes in the telecommunications industry in order to determine what effects these changes may have on the efficiency of the base telephone system, and to look for any opportunities which may become available to enhance this efficiency, to decrease telephone system costs, or to do both.

During this investigation it will become apparent that the recent purturbations within and without the telecommunications industry which have forced radical changes on the way that the industry's firms do business, will force radical changes on the way that the military base commander exercises cost-effective local resource allocation. Confronted with the rapidly changing telecommunications environment, the military base telephone/communications officer will be thrust into a much broader role with substantially greater challenges and responsibilities. Reaping the economic and operational benefits which the recent changes in the industry are making possible to the user of telecommunications services will require planning, vision and knowledge. The challenges are great, but the opportunities are greater. The military base communications

officer who knows how to plan, who can set goals for the future, and who knows where the industry has been and where it is likely to go, will find his or her job exciting and rewarding.

Since planning, acquisition, and management of telecommunications equipment and services in the future will require much more refined managerial skills and techniques, in this paper the military base communications/telephone officer will be referred to as the base telecommunications manager, as indeed he or she will be in reality.

3. The Presentation

An important tool for understanding the events taking place in and around the telecommunications industry today which should be available to the military base telecommunications manager is an understanding of the historical antecedents to these events. Therefore, this paper will begin with a sketch of the history of the telecommunications industry, placing emphasis on periods of increasing competition, and on the interaction between the Department of Defense and the industry. Also, since governent intervention has played a very important part in the recent restructuring process now going on in the industry, the changing emphasis placed on industry regulation by the government will also be discussed.

This will be followed by a discussion of the most recent developments: increasing competition, the Federal Communications Commission's Computer Inquiry II Decision, and the recent consent agreement between AT&T and the Department of Justice. Following that, a description of the industry with which the military base telecommunications manager will be dealing in the next few years will be presented.

With this background, the opportunities and the challenges confronting the military base telecommunications manager will be analysed, various new equipment and service options will be discussed, and acquisition and management strategies will be developed. Finally, a short discussion of possible future developments within the telecommunications industry will be offered, in order to point out some of the many as yet unanswered questions about the directions towards which the telecommunications industry will proceed, and to stimulate the reader to further interest in following this fascinating industry.

II. THE CHANGES

A. HISTORICAL PERSPECTIVE.

In order to gain a deeper understanding of what recent increases in competition will mean to the telecommunications industry and the affect these changes will have on the management of the military base telecommunications facilities, it will be valuable to reach back slightly more than a century to the invention of the telephone, and look at this and other periods of competition.

B. COMPETITION LED TOWARDS REGULATION

When Alexander Graham Bell's initial telephone patent rights expired in the mid-1890's, there began a period of intense competition between Bell's company and the myriad of independent companies which had sprung-up on the routes that Bell had not been able to cover before the protection of the patents ran out. By 1910 the independent (non-Bell) telephone companies accounted for nearly half of the telephone market, and rates had dropped sharply. Bell countered its competitors by refusing interconnection into its networks, buying-out the competitors, and various other anti-competitive tactics.

When the states, beginning with Indiana in 1885, started regulating rates on local telephone service, the Bell Company had opposed the action as unfair discrimination. However, by the turn of the century it had become apparent to all involved that the only way to achieve stability and rationality in the telephone industry was through some type of government regulation. When Theodore Vail was recalled after a twenty-five year hiatus to reassume control over the

Bell Company in 1906, he instigated a startling, innovative strategy of embracing regulation because it was in the best interest of the company [Ref. 3: p. 152]. In 1910 the telephone industry was placed under the Interstate Commerce Commission (ICC).

With the development of the diode in 1896 and the triode in 1907, true long distance communications networks became feasible. Both telephone and radio expanded rapidly and so did the nascent fields of motion pictures and broadcasting, leading to the establishment of the Federal Communications Commission (FCC) by the Communications Act of 1934. The FCC maintained relatively tight control of the telecommunications industry for the next quarter of a century. From its inception until the mid-1960's, the FCC made almost no decision which did anything but reject the various efforts of the challengers to enter the established markets of the common carriers.[2]

During the thirties and forties, the only service in which there was direct competition among the carriers was private leased line service, where AT&T and Western Union offered competing interstate lines for high volume communications users.[3]

The industry structure was probably appropriate for the time. Little need existed for service other than traditional voice telephone service. The right-of-way land costs, and other problems of building competing wireline networks, either between cities or within a city, made competition impractical. Thus markets for both transmission

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[2] A common carrier is a company which furnishes public telecommunications facilities, e.g., a telephone or telegraph company [Ref. 4].

[3] Leased line service is service whereby a user contracts for the exclusive, and generally continuous, use of a circuit [Ref. 4].

services and terminal equipment were well served. From the government's point of view, the dual national policy objectives of affordable, universal service and the construction of the most rapid and efficient system possible were best fulfilled through the regulated monopoly market structure.

C. MILITARY INVOLVEMENT WITH THE TELECOMMUNICATIONS INDUSTRY

The first telecommunications systems were developed for military use by the French army under Napoleon which built a system of signal towers, each equipped with a visual signaling device and a telescope. Similar systems were proposed for the United States during the War of 1812 but were not built. [Ref. 3: p. 55].

After invention of the telegraph in 1836, Samuel Morse and his backers first attempted to sell the patents to the United States government, but despite the recommendations of the Postmaster General, Amos Kendall, who wanted to put the development of the telegraph under the aegis of the Post Office (as it eventually came to be in almost every other country), Congress demurred. [Ref. 3: p. 62]. However, the government did get actively involved in the development of the telegraph during the Civil War and, by the time the War was over, the telegraph had become a truly nationwide communications network.

Just as the Civil War had had a dramatic effect on the development of the telegraph industry, the telephone industry and the entire telecommunications industry benefitted significantly by governments's need to communicate during the First World War. That event, coupled with the earlier developments in vacuum tube technology, led to the creation of nationwide and worldwide telephone and radio networks.

The period just prior to the First World War had been a period of intense technological development fostered by close cooperation between the War Department and the US telecommunications industry. Transatlantic telephone service in the United States had been initiated in 1914, and, in the fall of 1915, transatlantic radio communications were established using Bell System amplifiers and a Navy antenna at Arlington, Va. That November the first naval order ever sent by radiotelephone was transmitted by Josephus Daniels, Secretary of the Navy, to Rear Admiral Usher at the Brooklyn Navy Yard.

The military importance of these harbingers of the enormous extensions of the scope and capability of telecommunications led General McComb, President of the Army War College, to invite the Chief Engineer of the Bell System, J.J.Carty, to deliver a confidential lecture before the War College on "The Organization, Plant and Personnel of the Bell System". This lecture was repeated a few weeks later before the Naval War College. [Ref. 5].

In April of 1916, Bell System engineers began installating a radio telephone on the USS New Hampshire, and on May 7, this equipment, together with a transmitting installation at Arlington, Va. and a receiving installation at Norfolk, Va., was utilized in a demonstration of long distance radio telephone for the Navy Department. This demonstration was part of a national mobilization test conducted by the Bell System for the Navy during which all the United States Navy Yards were connected via telephone circuits to the office of the Secretary of the Navy simulating war-time readiness. Using a combination of Bell System facilities and its own radio stations, the Navy communicated satisfactorily from Washington, D.C. to the Panama Canal Zone (2,100 miles), Mare Island, Ca. (3,200 miles), and Honolulu (6,000 miles). This mobilization test

was done without any government financing and was in response to a letter from Josephus Daniels to Theodore Vail.

During 1916 Vail led the Bell System in quiet preparation for a war which had begun to appear not only possible, but probable. A considerable number of Bell System employees had been engaged in the military campaign along the Mexican border as members of the National Guard and their experience helped to bring to the attention of Vail the need for preparedness. Construction plans were enlarged to improve the nation's peacetime telecommunications facilities beyond the scope which would be required for normal economic growth and expansion. Top Bell System managers drew up plans for possible mobilization of trained craftsmen, research scientists, engineers, and managers and workmen in the Western Electric factories.

Bell's Chief Engineer, J.J. Carty, was commissioned a major in the Army Signal Corps in 1916 --the highest position which it was possible to issue to a reserve officer and the first such commission issued by the Signal Corps.

The American Army, of all the armies in the field during the First World Was was the only one able to avail itself of the capabilities of radiotelephone [Ref. 5: p. 22].

In July 1918, President Woodrow Wilson issued a proclamation assuming control of the national telephone and telegraph systems in the United States, placing them under the direction of the Post Office Department. However, the Postmaster General did not get actively involved in the management of the telecommunications industry and his authority was relinquished one year later [Ref. 5: p.28].

During World War I, the United States Navy assumed responsibility for all infringements on the British Marconi radio patents and responsibility for all radio services. The Navy also wanted to retain control of all coastal radio stations after the War, but Congress would not allow it to do so.

During World War II, Bell Laboratories performed more than two thousand projects for the military. Western Electric, the Bell Systems's manufacturing arm, helped produce radar and gun direction systems, communications equipment, sonar, proximity fuses, magnetic mines, and acoustic torpedoes.

The close relationship between the Department of Defense and the telecommunications industry in the preparation for and the execution of the country's defense continued after World War II. In the early 1950's management problems developed at the Sandia Laboratories at which components for nuclear weapons were produced. Bell Laboratories and later Western Electric took over the management duties and the problems were resolved [Ref. 3: p. 188-190]. Today the Sandia Laboratories are Sandia Corporation, a wholly owned subsidiary of Western Electric, run with help--for no fee---from the Bell Laboratories.

There are many other examples. For instance, the Bell System built the first switched military telephone network, AUTOVON, which has become the world's largest private network, and it installed the communications equipment in the Combat Operations Center of the North American Defense Command, deep within a hollowed-out mountain in Colorado. Bell Laboratories has worked on the development of radar, sonar, and fire-control systems, was the prime contractor of the Nike anti-aircraft missile and the Safeguard Anti-ballistic Missile System, and managed the Distant Early Warning (DEW) line of radar stations from Alaska to Iceland. For decades, Bell System engineers have hardened cables and placed switching centers outside metropolitan areas, on the assumption that they would be the first to go in a nuclear attack. [Ref. 6]. Bell Labs has done a great deal of research into protection of communications systems against electromagnetic pulse (EMP), the burst of electromagnetic

energy that is created when a nuclear weapon explodes in the upper atmosphere and which is capable of knocking out the nation's entire communications system--both military and civilian, and is actively seeking to more than triple its amount of defense work [Ref. 7].

So close was the relationship between DOD and AT&T that during the antitrust hearings against AT&T and Western Electric during 1981, a report prepared by Department of Defense lawyers stated:

> DOD can unequivocally state that divestiture as currently proposed by Justice (i.e. divertiture by AT&T of its Western Electric subsidiary, its Long Lines Department, and of some of its operating companies) would cause substantial harm to national defense and security and emergency preparedness telecommunications capability. [Ref. 8: p. 990].

D. FIRST ANTITRUST ACTION

In 1949 the Department of Justice (DOJ) initiated antitrust proceedings against Western Electric, the manufacturing arm of the Bell System. The Justice Department charged Western Electric and AT&T with a conspiracy to restrain trade, and charged Western Electric with monopolizing the market for telephones and related equipment, both practices in violation of the Sherman Antitrust Act. In 1956 AT&T and the DOJ settled on a consent agreement in which AT&T and Western Electric agreed to restrict their activities solely to the regulated telecommunications world in return for cessation of the antitrust suit. One reason why the Justice Department agreed to drop the suit against Western Electric was that the prosecutors thought that competition would increase equipment prices [Ref. 9: p. 50.].

E. ALTERNATIVE TRANSMISSION METHODS

During the period following World War II, a chink appeared in the Bell System's armor which culminated in the FCC's Above 890 Decision in 1959. Prior to the war, the Bell System had invested extensively in coaxial cable systems in anticipation of video traffic. The war effort had produced a series of technological developments which produced an alternative technique for broad-band communications--microwave point-to-point transmission. Microwave transmission used technology for which AT&T did not hold patents; and it did not require rights-of-way, thus bypassing two of the significant barriers to entry into the telecommunications field. The low cost of microwave transmission relative to long distance telephone service costs at the time also made private networks attractive to large companies with a high volume of internal traffic.

Also after the war, the market for television video began to develop with Western Union and Philco building microwave networks on the East Coast. AT&T simply refused to interconnect these networks into the Bell System. But even though the FCC allowed AT&T to refuse interconnection by the Western Union or by the Philco networsk, nevertheless IBM, GE, Raytheon and Philco embarked on building their own microwave networks in the late 1940's (IBM's and GE's networks were for data transmission, not video), and AT&T was forced to enter a crash program to build its own microwave networks.

AT&T then attempted to exert its influence with the FCC to reserve usage of microwave frequencies above 890 megahertz (MHz), to common carriers only. In the Above 890 Decision in 1959, the FCC denied this restriction and made it possible for private users to gain access to frequencies-- with FCC approval, of course--and for large

businesses to construct networks to serve their own needs. However, private networks were still unable to interconnect with the Bell System. [Ref. 10].

In the Above 890 Decision, the FCC Commissioners disagreed with the Department of Justice prosecutors' reservations concerning the probable consequences of increased competition upon the telecommunications industry, and entered one of the Commission's first major anti-Bell decisions: "We feel that extended eligibility will afford a competitive spur to the manufacturing of equipment and in the development of the communication art " [Ref. 9: p.81.].

When faced with the microwave challenge, AT&T responded by offering services not previously available. Initially it offered bundled telecommunications packages called "Telpak" which offered large users substantial savings over private line rates. In this aggressive effort to keep its competitors at bay, the Bell System was offering a dramatic reduction in rates--so dramatic that the FCC later disallowed some of the Telpak tariffs which they described as "predatory"--solely to force out the competition. (Rates which were initially set well below anything that the competition could feasibly offer were followed by two price increases totalling nearly seventy percent in the next ten, non-inflationary years. Telpak is no longer available to new subscribers in any form.) A more successful effort developed by the Bell System in order to meet the new competition head-on was the highly successful WATS System.*

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*WATS (Wide Area Telephone Service) may be either inward or outward. WATS inward is an arrangement whereby a customer, by paying a charge, can authorize a telephone company to route calls in to the customer from calling lines in prescribed areas without the callers being required to pay for their calls. WATS outward is an arrangement whereby payment by the customer of a monthly fee enables the customer to make an unlimited number of long distance calls to stations in prescribed areas up to a preset time limit [Ref. 4].

In 1963, a newly formed company, Microwave Communications Incorporated (MCI - later, MCI Telecommunications Corporation) filed with the FCC to build a microwave link between St. Louis, Missouri, and Chicago, Illinois, for low-volume data transfer by businesses. In 1968 the FCC granted MCI's request.

When MCI filed its petition with the FCC in 1963 it envisioned a microwave system in which MCI would provide the link, but the users would have to supply their own distribution system at either end. Such a low-volume data transmission net was part of a market which had not been recognized by AT&T. That such a market did in fact exist was evidenced by the fact that in the period following the MCI Decision, the FCC was flooded with thirty-seven applicants for specialized common carrier status.

Ultimately, in 1971, the FCC authorized private-line intercity common carriers--Specialized Common Carriers (SCC's)-- to hook-up with the local Bell System exchange.

In the Specialized Common Carrier Decision in 1971 [Ref. 11], the FCC determined that rather than entering a fixed market with the same services as the common carriers, the specialized common carriers were seeking to develop new services and markets. Thus they could be expected to satisfy demands that were not met by the existing carriers, and to expand the size of the total communications market. The FCC issued a broad directive to the telephone carriers to make facilities--including interconnection to the public telephone networks--available to such new carriers on a reasonable and non-discriminatory basis for the local distribution of a specialized common carrier's intercity traffic.

While there was no stampede to fill the ether with microwave signals (most of Bell's competitors at the FCC hearings were more interested in producing equipment than in

building microwave networks), the door opening the way towards increased competition for Bell and for the other common carriers was now ajar.

Almost immediately after the FCC approved MCI's application, Datran Corporation was formed to build a nationwide microwave network. Such a nationwide microwave system for data transmissionaddressed another market area not pursued by AT&T, although it did have provisions for data transmission on voice grade networks (a slow and error-prone method).

Competition for the Bell System's underseas cable international service began with the Satellite Act in 1962. International carriers (including AT&T) agreed to participate in COMSAT (an entity created by the Satellite Act to sell services to overseas carriers) even though it would purchase hardware and related supplies on a competitive bid basis, and not necessarily from the manufacturing arms of the participating carriers. The Satellite Act also permitted COMSAT to sell circuits to overseas customers directly if they qualified as authorized users.

Soon after the passage of the Satellite Act the Department of Defense solicited bids for thirty voice-grade circuits to the Far East and, when COMSAT's bid of four thousand dollars per circuit stood in contrast to the carriers' bid of twelve thousand dollars, the Department of Defense tried to circumvent the carriers' mark-up and negotiate with COMSAT directly.

The FCC removed COMSAT from its dilemma by denying authorized user status to most applicants. The Commission reiterated its position that satellites should not compete with, but should supplement, underseas cable facilities, and that COMSAT should sell essentially to the overseas operations carriers who, in turn, would make their facilities available to customers. The Commission held that

introducing competition would disrupt the rate averaging principle, tend to benefit large users to the detriment of small users, "cream-skim" revenue from the carriers and hence, strain their financial position. The Commission agreed that, although Congress gave its power to assign the authorized user status to certain subscribers, that status should be granted under special and unique circumstances only. The one exception to the FCC ruling was NASA'S Apollo Project. [Ref. 9: p.104].

F. EQUIPMENT INNOVATIONS

In 1956, a seemingly innocuous device, the Hush-A-Phone--a piece of foam rubber which could be placed on the mouthpiece of a telephone to allow the user to carry on a telephone conversation in a high noise environment--started a slow but steady procession of increased competition for AT&T and its manufacturing subsidiary, Western Electric.

Up until that time AT&T had maintained that nothing could be attached to its components except by the Bell System in order to forstall any potential damage to the network. While the FCC upheld the AT&T stricture in the Hush-A-Phone suit, the case was subsequently reversed by the Court of Appeals. [Ref. 12].

In 1968, the Hush-A-Phone resolution was carried a significant step further with the Carterfone Decision. [Ref. 13]. In that decision the FCC authorized attachments to Bell System equipment as long as it could be shown that no damage would be incurred by the network, thereby making terminal interconnection available to even non-telecommunications equipment providers.[5]

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[5] The Carterfone acoustically and inductively interconnected mobile radio systems with the local telephone network.

G. THE BELL SYSTEM'S INITIAL RESPONSE

During the years following World War II, AT&T had seen the influx of two basic types of competitors: new entrants to the telecommunications industry who offered service where there was an unanswered demand, and new entrants who entered the industry with alternative technologies.

The Bell System's responses were typical defender tactics. Initially AT&T had rigorously opposed the FCC's decision to allow MCI to set up its microwave link, but once it had accepted the inevitability of competition in this new market, AT&T took aggressive action on the technological front and developed a data transmission system of its own that proved to be more than financially competitive with the MCI System.

After the Hush-A-Phone decision, AT&T filed an appeal in the courts, but subsequently voluntarily dropped its suit. Instead, AT&T insisted that it provide an attachment device, leased by Bell to equipment manufacturers, which would be used to attach the equipment to the Bell System. Soon there was a proliferation of recorder/answering systems, burglar alarms, local switching systems and intercom systems connected to the AT&T network. However, even Bell's attachment device was rendered unnecessary in 1975 when the FCC adopted a federal registration program for terminal devices. [Ref. 15: p. 125]. In January, 1980, the FCC officially found that interconnection of consumer-provided telephone equipment to the telephone system had not hurt the economic position of the basic common carriers nor of anyone else, but that it had helped the general public by speeding the rate of innovation and helping to meet previously unmet consumer needs [Ref. 14].

After Datran began it build its nationwide data network, AT&T countered by offering a system called Data-Under-Voice, but it should be noted that the Bell System had not felt compelled to develop data transmission technology until challenged by new entrants to the telecommunications field who sought to provide such service. AT&T either felt little need to service the data-transmission market until competitors tried to enter, or it simply did not choose to provide a means cheaper and more effective than voice channels in order to service the demand.

AT&T has complained that the regulatory agencies themselves have been slowing competition by handicapping the introduction of new products. Kenneth J. Whalen, Head of American Telephone's Marketing Department, complained: "When I wanted to introduce our new Snoopy phone, I had to go to 54 different regulatory bodies, and they are approving it at different times" [Ref. 15: p. 125]. For the most part, American Telephone's complaints have fallen on fifty-four sets of deaf ears.

AT&T has also been hindered by the rate structure which the regulation agencies forced it to maintain. The company had to set prices according to strict, fully distributed cost standards (rather than the actual cost of service), and had to increase the portion of its interstate revenues used to subsidize local service, forcing AT&T to keep an artificially high rate structure. This hindered moves to modernize the Bell System's service offerings, and had the effect of offering new competitors a price umbrella under which to compete for business traffic [Ref. 16: p. 160].

Nevertheless, AT&T still believed that regulation was a desirable barrier against competition, and continued its attempts to encourage regulations which would inhibit its competitors. Bell's last ditch attempt to pursue this course came in 1976 when it sponsored the Consumer

Communications Reform Act. Dubbed the "Bell Bill" by opponents who saw it as "self-serving" for AT&T, it was soon derailed despite an unprecedented lobbying effort by AT&T.

B. BEGINNINGS OF A NEW STRATEGY

Starting at the time of the Carterfone Decision, AT&T, recognizing that it was beginning to experience stiff competition on several fronts, began efforts to retake the offensive, and, in 1970, John deButts, American Telephone's Chief Executive Officer (CEO) at the time, began grooming the Bell System for increased efforts in marketing and for increased responsiveness to customer desires.

Realizing that Bell's choice in the post-Carterfone Decision era was either to change or not survive, deButts elected to meet the challenge by totally revamping the company's structure, broadening its concept of its products and services, and changing its goal from that of mastering the regulatory process to meeting the needs of the marketplace. To accomplish these goals, he choose a four-pronged strategy:

(1) Total revamping of American Bell's operation, changing either the titles, assignments, or responsibilities of one third of Bell's work force;
(2) Overhauling of the company's marketing program;
(3) Dealing with the most confusing and potentially threatening regulatory environment that the company had ever seen;
(4) Reorienting personnel to competition [Ref. 15: p. 115].

In 1973, in one of the initial steps towards implementing the above strategy, AT&T hired Archie McGill, a highly-respected marketing expert from IBM, whose marketing techniques were acknowledged to be among the best in any industry, to fill the newly created position of marketing manager for the Bell System--a doubly significant appointment because it was the first time that Bell had filled a high level post without promoting from within. In McGill's words: "I was brought on board to help the company understand the market. It's missionary work I'm doing" [Ref. 15]. In 1977, Bell changed its motto from "We Hear You" to "The System Is The Solution".

In 1977, American Telephone began reorganizing itself along the lines of its major marketing segments. Prior to that time, it had been one of the few major organizations which still held on to functional divisions. For example, all sales efforts had been lumped together in a service department called "commercial" which dealt with residential and business customers alike. Under the reorganization, telephone installers would work on either residential or business jobs, but not both; and each department would be totally responsible for serving all of the needs of its market segment, not only installation and repair of equipment, but also developing new business and designing new systems.

The dedication of deButts to his strategy led him to ultimately seek early retirement. He had been so adamantly opposed to competition in any form that he realized that he did not have the credibility to handle the compromises that would be necessary to get the most out of the government's movements towards deregulating the telecommunications industry, that he choose to step down a year early and hand over the reins of the company to Charles L. Brown in 1978.

A less outspoken and publicly visible man, Brown was seen as a flexible, pragmatic, and broadly experienced operations man. He had held twenty-three different positions with the phone company in ten cities; he had been named the first dean of Bell's Data Communications School in 1961; and, while President of Illinois Bell, he had responded to the FCC's Carterfone Decision by creating Illinois Bell's first separate marketing department as part of a broader plan to respond faster to needs of business customers. With this changing of the guard, deButts completed his grand scheme to unleash Bell's new assault on the telecommunications market [Ref. 15: p. 115].

I. FCC'S SUPPORT FOR COMPETITION

Recently, new entrants into the telecommunications industry have been receiving favorable decisions from the FCC itself, while in previous decades a challenger had to persevere beyond the Agency into the courts (e.g. the Hush-A-Phone case) or to petition for legislative or executive redress in order to succeed.

In discussion of its MCI Decision the FCC stated: "Competition in the specialized communications field would enlarge the equipment market for manufacturers other than Western Electric, and may stimulate technical innovation and the introduction of new techniques" [Ref. 9].

In 1972, the FCC's efforts to ensure competition in the telecommunications industry went so far as to lead to the Commission's decision to prohibit AT&T from utilizing its satellite facilities for private line service for three years while putting no such restriction on the other carriers [Ref. 17]. In the words one commentator,

> The Commission realized that other carriers might be deterred from attempting to enter the specialized satellite service markets by (the Bell System's) existing

> economic strength and dominance, and by its unique ability to load a high capacity satellite system with monopoly telephone traffic [Ref. 18: p. 52.].

In 1976, the FCC adopted a policy of abolishing all carrier regulations banning the unlimited resale and sharing of common carrier private line facilities and services [Ref. 19]. By doing this the Commission expected:

(1) Rates for communications services which are more closely related to costs;

(2) Better management of the communications network;

(3) Management expertise in users and communications intermediaries;

(4) Avoidance of waste in communications capacity; and

(5) Creation of additional incentives for research and development of ancillary devices to be used with transmission lines [Ref. 18: p. 54.].

This move towards governmental support for increased competition in the telecommunications industry reached its culmination in the first three years of the current decade with the FCC Computer Inquiry II and the AT&T/DOJ Consent Agreement. Whether the industry has come full circle and returned to the free-for-all atmosphere of the end of the last century and whether it will eventually see the pendulum swing back in the direction of increased governmental regulation remain to be seen.

III. THE TELECOMMUNICATIONS INDUSTRY TO 1980

A. STRUCTURAL CHANGES

AT&T has estimated that business firms in the United States spend in excess of seven hundred million dollars on communications--postage, preparing written correspondence, travel and meeting expenses, and telecommunications--of which just over ten percent is accounted for by telecommunications costs alone. The nearly one hundred billion dollar a year industry that meets the country's telecommunications needs, was (and is), despite increased competition, still dominated by the Bell System. In 1980 Bell Telephone provided eighty percent of this country's telephones and ninety-seven percent of its long distance needs.

In order to differentiate themselves from the Bell System, the rest of the players, especially the "other" common carriers were shifting to "value-added" services. For example, MCI added Omni Call, a service that automatically picks the least costly method of making a long distance call for its customers.

How fast the markets for new services grew would depend on how well telecommunications companies' marketing departments are able to educate people to make them aware of, and desirous for, new products and services. The telecommunications companies had begun making a concerted effort to tailor their new products to customer's needs rather than merely offering them one take-it-or-leave-it service.

The independent companies were selecting fairly well-defined niche markets--such as MCI's Execunet and Western Union's Mailgram Service in the public services market. Private communications networks were being offered by

Southern Pacific, American Satellite and Satellite Business Systems. These niche markets were carefully chosen so as to avoid competition with AT&T or IBM.[6]

E. EFFECTS OF INCREASED COMPETITION IN THE INDUSTRY

1. Benefits To Users

The FCC had required the common carriers to use an average per mile rate for many of their services without regard to the particular costs the carrier encountered in providing the service. The rates for services were uniform for equal distances. The SCC's were able to successfully enter highly profitable network routes without having to keep their prices artificially high in order to subsidize the less profitable routes and networks.

Also, it had been to the advantage of the established carriers to maintain existing technology in which they already had a major capital investment, until the investment in that technology was fully depreciated, with little incentive to develop alternative technologies. The common carriers also had an economic incentive to invest as much money as possible in plant and other rate-base items, so that the fixed rate of return would produce the greatest amount of revenue. Coupled with the capital intensive nature of the telecommunications industry, this incentive served to retard the adoption of new and/or cheaper technology.[7]

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[6] As the lines of demarcation between telecommunications and computer data networks become less clear, these two industry giants appeared ready and willing to engage in competition in each other's markets [Ref. 20].

[7] Regulated industries engage in "cost-plus" pricing, the "plus" denoting a reasonable return upon the firm's depreciated investment base.

Furthermore, the cost of new long distance facilities had fallen sharply in the previous two decades, while the cost of new local plants had soared because of rising labor costs and the high labor-intensity of local plant installation [Ref. 16: p. 162].

Therefore, in the past several years, for these and other reasons, competing long distance companies such as MCI, Southern Pacific Telecommunications, ITT, etc., had been offering customers the choice of much lower cost services, making previous common carrier strategies directed towards maintaining high rates obsolete, and giving the established carriers renewed incentive to seek technological improvement. These competitors choose high-density, low-cost routes, either bypassing smaller cities or using circuits leased from the common carriers to serve them.

Whether because of "cream-skimming" as AT&T describes their choice of routes, or because of newer technology, the long distance competitors to AT&T at the end of the 1970's had begun to offer substantial discounts over the Bell System's rates. Table I shows comparative rates for a five minute call between New York and Los Angeles during normal business hours at the rates in effect in April, 1982 [Ref. 21].

Competition in the equipment industry also was lowering prices for the customers and increasing the options available to them. One example was the telephone answering device. Prior to the initiation of the FCC's terminal equipment registration program the only answering machines available were provided by the Bell System and were quite expensive--costing about five hundred dollars ($500) in the late 1960's. By 1976, the average wholesale cost of answering devices purchased by industrial users from competing sources was approximately two hundred and twenty dollars ($220). Smaller answering devices designed for

TABLE I

Long Distance Service Costs

Type of Call	CARRIER	COST
Person-to-Person	AT&T	$5.20
Station-to-Station Operator-Handled	AT&T	4.25
Direct-Dial	AT&T	2.70
"Other Common Carrier" (CCC)	ITT-USTS (City Call)	2.48
WATS-Band, 5-10 Hours	AT&T	2.16
"Other Common Carrier"	SP Communications (Business SPRINT)	2.14
Resale Carrier	TDX Services (Econocall)	2.12
"Other Common Carrier	MCI Communications (Execunet)	2.08
"Other Common Carrier"	Western Union (Metrofone)	2.02
Mileage Insensitive (10 Hours)	MCI Communications (Network Service)	1.95
WATS-Band, 5-25 Hours	AT&T	1.93
WATS-Band, 5-50 Hours	AT&T	1.77
WATS-Band, 5-100 Hours	AT&T	1.56
Satellite, 50 Hours	Satellite Business Systems, Tier 1	1.55
WATS-Band, 5-140 Hours	AT&T	1.49
Mileage Insensitive (25 Hours)	MCI (Network Services)	1.49
Mileage Insensitive (50 Hours)	MCI (Network Services)	1.29
Satellite--100 Hours	SBS, Tier 1	1.26
Satellite--140 Hours	SBS, Tier 1	1.13
Mileage Insensitive (100 Hours)	MCI (Network Services)	1.29
Mileage Insensitive (140 Hours)	MCI (Network Services)	0.87

individual consumers and available through non-AT&T suppliers cost only about seventy dollars ($70) in 1980. In 1974 there was a total installed base of one hundred and fifty thousand (150,000) answering devices provided by the telephone companies, while six hunderd and fifty thousand (650,000) customer-provided answering devices were utilized by commercial/industrial users and individual customers. These figures indicate that the new competitive suppliers, while fulfilling consumer needs, also dramatically lowered the price of answering machines.

Many other benefits had come to the telecommunciations industry as a result of competition in the previous quarter century. For example:

(1) American Telephone's first proposals for a communications satellite system for the United States was predictably capital intensive and technologically conservative--fifty satellites in a six-thousand mile high system. Non-telecommunications industry firms such as Hughes Aircraft proposed the subsequently highly successful system of three to four geosynchronous satellites.

(2) Pushbutton telephones were developed by Northern Electric, a subsidiary of Canadian Bell, a firm whose only tie to AT&T is use of the Bell name.

(3) Two years after the Carterfone Decision, sixty independent companies were marketing data terminal equipment.

(4) Even though the Bell System had ninety-four percent of the phone business in the US in 1980, more than fifty percent of the private branch exchange (PBX) market for businesses belonged to independent suppliers.

Additional anticipated economic benefits for the user included substantial (thirty to fifty percent) reductions in long-distance rates because of the continuing decline of hardware costs, and because of the heating-up of the competitive pressures. The forecast supply glut in the interconnect market was expected to hold down or even reduce prices until the unprofitable firms are forced out of the market. On the other hand, consumers could expect substantial increases in local rates.

2. Competition: A Two-edged Sword

a. Vertical Integration

Heretofore the assumption in this paper has been that competition in the telecommunications industry will be beneficial to the user; however, this is not necessarily the case. Within two years after MCI was granted authorization to set-up its network the FCC had more than seventeen hundred applications for microwave stations. However, DATRAN, which attempted to establish a nationwide microwave network failed, giving rise to questions about how much competition would be beneficial to the industry. Nor is it completely certain that ending the vertical integration of AT&T will be to the consumer's best interests.

Economists studying the effects of vertical integration have concluded that the social benefits or costs depend upon the particular market conditions and the facts surrounding the specific case. In certain cases, vertical integration may offer some very positive values to the economy:

(1) Vertical integration may reduce or eliminate some costs such as selling and advertising expenses;

(2) It may eliminate certain taxes; may yield economies of scale; and

(3) It may enable companies to eliminate entire productive processes.

Some analysts, including John Kenneth Galbraith, have concluded that in certain situations vertical integration yields will have a healthy influence on the diffusion of new technology [Ref. 9: p. 113-114].

Indeed, at least one economic analysis has shown that there do exist many plausible situations where vertical integration may result in a decrease in the price of final

products or in an increase in output which could lead to a decrease in price [Ref. 22].

However, such positive expectations from vertical integration assume competitive market forces at work in providing constraints on the behavior of both the supplier and the customer. When the subject of analysis is a regulated public utility, the prospect is not quite so sanguine.

The vertically integrated, regulated utility operates in a market environment where the sale of the utility's principal services and the prices paid for the equipment and facilities, are not subject to a competitive market test, and where the manufacturing arm is not regulated. The barriers to entry into the service market become extended to the equipment market and the utility becomes insulated from market forces to a much greater degree than it would without regulation or than is required or intended by regulation. The incentive for increasing profits and decreasing costs in the conventional ways is likely to be significantly less for a vertically integrated regulated monopoly; and the monopoly may also use the regulatory authority to sanction corporate practices and anticompetitive behavior that would, absent regulation, represent violations of the laws against unfair competition--such as interconnection prohibitions, contract and tariff restrictions and discriminatory, and predatory pricing.

Vertical integration of a public utility seems to extend all the defects of utility regulation into the equipment market with no obvious compensating advantages. It tends to create monopoly power in an unregulated market; it tends to weaken the effectiveness of regulation in the service market; it provides the firm with an enormous array of strategies for counteracting the intended effects of regulatory polities that conflict with the firm's objectives.

Vertical integration of a regulated monopoly also disrupts the incentives of the captive supplier. The supplier assumes the stance of a public utility, endowed neither with the accountability of a franchise monopolist nor the accountability of a firm exposed to direct competition. [Ref. 9: p. 126-27].

If an unregulated manufacturing subsidiary is inefficient or has outright padded its records, the higher costs may simply be passed on to the consumer by the regulatory authority. The regulated monopoly generates little motivation for the subsidiary's development of new equipment which will render obsolete that which has already been supplied. Nevertheless, in its thirty-seven year history the FCC has never found it necessary to disallow Western Electric's prices billed to AT&T regulation.[8]

b. Divestiture

After the divestiture which is scheduled to go into effect by the start of 1984, local rates will still be subject to public utilities commissions and subsidies from AT&T Long Lines Division will be replaced by access charges billed to the users. However, if access charges are set too high, major business telephone users (such as the government) and long distance companies will most probably opt to build private networks or to find other alternatives that bypass the local networks entirely.

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[8] Other regulatory commissions have, on occasion, examined the reasonableness of Western Electric's reported rate of return; and have also concluded that Western Electric has been sensitive to the magnitude of its rate of return [Ref. 9: p. 125].

There can be no doubt that the Department of Justice firmly believes that diverstiture of the the Bell Operating Companies by AT&T will have a positive impact on the telecommunications industry and that the unbridled entrance of the Bell System into the telecommunications and data communications markets from which AT&T had been banned by the 1956 Consent Agreement will be beneficial to these markets. In the competitive impact statement filed by the DOJ a few weeks after the initial announcement of the Consent Agreement, the Agency made the following predictions:

> Put in simplest terms, the functional divestiture contemplated by the proposed modification will remove from AT&T the power to employ local exchange services in ways that impede competition in interdependent markets, and will remove from the BOC's, which will retain such power, any incentive to exercise it. The United States believes, therefore, that the modification's divestiture requirement, and its complementary injunctive provisions, will substantially accelerate the development of competitive markets for interexchange services, customer premises equipment, and telecommunications equipment generally... There is every reason to believe that, divested of the BOC's, AT&T will be a procompetitive force in the markets that it enters. As a result of the modification, it is likely that AT&T will expand not only its product lines, but also the areas in which it sells telecommunications equipment. Thus it is likely that AT&T will compete for sales of telecommunications equipment to independent telephone companies [Ref. 23].

c. Advantages Of Competition

Economists have generally been predisposed to favor competition as a form of organization for any industry. They have usually taken this position not primarily because they feel that competition is desirable in and of itself, but because they believe that it offers a number of important advantages. It gives greater scope to individual independence and freedom, creates more centers of power and avoids the political risk of excessive concentra-

tion of economic power. In economic terms, it offers three basic benefits to consumers:

(1) Pressures for rapid innovation,
(2) Pressures for maximal product quality at any given selling price,
(3) Pressures to supply the service at minimum cost to consumers given the quality of the product [Ref. 24].

For example, in March 1981, the Government Services Administration (GSA) announced that it would seek competitive bids to lease eight thousand long distance circuits linking major cities in the continental United States. This represents seventy-five percent of all government leased phone service that can be handled on a competitive bid basis. GSA, which normally pays fifty million dollars per year to AT&T, is hoping that increased competition in the long distance market will lead to lower rates and enable it to realize substantial savings.

C. THE BELL SYSTEM

In a company as large as AT&T, change occurs very slowly, and by the end of the 1970's the strategic changes instituted by John deButts has only just begun to take effect. There were still many hurdles to be negotiated.

The Bell System had been handicapped by a line of products that was considered out of date. Bell had not made or marketed many of the more popular telephone accessories such as answering machines, and it had only recently entered the world of digital PBX's.[9]

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[9] PBX, private branch exchange, is a small, local telephone office, either automatic or mannually operated, serving extensions in a business complex and providing access to the public network [Ref. 4].

Nor did it supply many of the more popular customer-desired equipments such as answering machines. And Bell supplied only sixty-eight percent of the $8.7 billion in PBX systems then installed.

American Telephone's Bell System also suffered from an unimpressive record regarding its ability to install and maintain telephone equipment. Its sales force is considered weak in the important area of followup. However, Bell had begun to assign specific clients to technicians and to give them full responsibility for coordinating installation and repairs.

As seen previously, AT&T did not choose to accept these changes to the industry lying down. Recently, Hugh B. Jacks, American Telephone's national director of business services choose the eagle to symbolize the new competitive spirit he is trying to instill in his 60,000 person maintenance force because, he says, "...storms bring out the eagles, while little birds fly for cover" [Ref. 25: p. 66.].

AT&T is now in the process of teaching its one million employees to please customers after decades of encouraging them to please regulators. At AT&T Archie McGill has phased in commissions and today commissions account for as much as fifty percent of the pay of a typical account executive. McGill has also realigned the sales force into twenty-eight industry specific groups and is attempting to instill the philosophy in the sales force that they sell solutions rather than merely communications.

D. THE STAGE IS SET

The changes in the telecommunications industry which had transpired in the previous quarter of a century had turned a stodgy, well-defined industry into an exciting, innovative one in which announcements of new and intriguing devices to

lower costs and/or increase capability had become commonplace. Competition and its complement, technological development, had transformed then entire industry--including its most monolithic member, AT&T--and the expectation was that the customer would be much the better for this. The military base telecommunications manager--or any corporate telecommunications manager--was in the enviable position in which he or she could watch with detachment as the giants of the industry battled among themselves for his or her business. The telecommunications manager expect increasing benefits at relatively decreasing costs with little or no risk and little or no need for intensive management on his or her part.

But in 1980 and again in 1982, the telecommunications industry and its customers received major jolts which promise to significantly affect how the industry and its customers conduct their business in the years to come. Whether the firms in the industry were prepared for it or not, the structure of the telecommunications industry was about to become more complex; and whether prepared for it or not, telecommunications managers were about to be thrust into a milieu in which their managerial abilities would be put to the test.

IV. DEREGULATION

A. WATERSHED

In 1980 and again in 1982, the telecommunications industry and, in particular, AT&T experienced events which can be expected to have profound effects on the industry. These events were a continuation of what had occurred in the previous years, but were of such major proportions that they rated major headlines not only in the industry journals, but in papers and magazines accrossed the country. They will affect the telecommunications industry both quantitatively and qualitatively. Understanding the events which led up to them, the events themselves, and their implications will aid the base commander and the base telecommunications manager in recognizing the opportunities which are becoming available as a result of these events.

B. FCC SECOND COMPUTER INQUIRY DECISION

1. Background

As early as two decades ago, it became apparent that, due to advances in technology, voice and data communications industries were merging. In the digital world of computer technology, bits are bits, and regulatory schemes based on distinctions between voice, data, video, etc., were becoming obsolete. Regulations were hampering the telecommunications industry and slowing the introduction of new technologies and new services to consumers. This placed the FCC on the horns of a dilemma. On the one hand, it appeared that the telephone industry would not be capable of fulfilling data transmission requirements, and, therefore,

major modifications would have to come about which could not take place without the assistance of AT&T, or an entirely new industry would have to emerge. On the other hand, the Commission was concerned that the Bell System would use its market leverage as the dominant entity in the telephone industry to monopolize any new data processing industry as well.

The FCC recognized the importance of these issues and, in 1965, it instituted a proceeding known as the First Computer Inquiry [Ref. 26]. That inquiry reached four important conclusions:

(1) Communications facilities and services related to computer/communications services were in their infancy;

(2) Timely development of communications services adapted to the special needs of computer users were critical to U.S. economic growth and needs;

(3) A number of computer users were dissatisfied with many aspects of the telephone communications capabilities;

(4) Special private line capabilities were needed for many data communications applications, particularly high speed data transmissions [Ref. 18: p. 44].

The question faced by the FCC was whether to extend regulation to computer communications networks or to begin deregulation of the telecommunications industry. That there was still a great deal of confusion even more than a decade later was evident in the Commission's decision in 1977 to grant AT&T permission to market its Dataspeed computerlike terminals, in apparent disregard for the 1956 Consent Agreement. The Commission decided that increasing competition and innovation in the industry was more important than standing on precedent.

The FCC's efforts towards encouraging increased competition in the telecommunications equipment market culminated in 1980 in the Computer Inquiry II Decision.[10]

2. Results Of The Decision

In its Computer Inquiry II Decision, the FCC ordered all telephones and other telecommunications equipment to be sold on a competitive, unregulated basis and told AT&T to set-up a fully separated subsidiary to market these products. The Commission came to the same conclusions regarding new computer-augmented communications services, leaving only basic telephone transmission services to be regulated in the future.

The following comments by Charles Ferris, FCC Chairman from 1977 until 1981, serve to explain the Commission's position:

> Many of these (FCC) rituals have become an additional, altogether unnecessary hurdle which new technologies must overcome before consumers can receive their benefits. At worst, some new technologies have been delayed significantly while vested interests used the regulatory process to slow progress. ...the energy expended on outwitting regulators is always wasted. In an era when society is conscious of the scarcity of resources, removing those regulatory barriers to entrepreneurial and technological innovation in communications should be one of our highest priorities...Regulatory schemes based on distinctions between video, voice, and data are rapidly becoming obsolete. ...I believe that the last three years have established a trend in regulation that will bring new technology to communications markets soon. ...The reduction of rate and entry regulation should result in lower prices and more innovative services. ...One job of regulation...is to assure opportunities for all in these new enterprises [Ref. 27: Forward].

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[10] Actually Computer Inquiry II encompasses a series of three decisions issued in April and December 1980, and October 1981, all three included under Docket No. 20828.

a. Enhanced Services

The Commission distinguished between "basic" services and "enhanced" services. Basic services are the transmission capacity betweeen two or more points suitable for a user's transmission needs and subject only to the technical parameters of fidelity or distortion criteria, etc. FCC jurisdiction and regulation of basic services was not affected by the Computer Inquiry II Decision. Enhanced services combine basic service with computer processing applications, which may be used to act on the form, content, code, or protocols of the subscriber's information, thereby providing additional, different, or restructured information. Enhanced services were deemed outside the FCC jurisdiction unless provided by a communications common carrier, in which case the enhanced services would be subject to FCC jurisdiction, but would not be regulated. All carrier-provided enhanced services which were under tariff in 1980 would be detariffed (i.e., deregulated) by March 1, 1982.

Bell System companies could provide enhanced services only through a separate corporate entity (immediately dubbed "Baby Bell" by industry wits) on a resale basis. This enhanced service entity would not be able to provide basic services except as part of enhanced services within a customer's business location. "Baby Bell" would be required to acquire transmission capacity from a carrier pursuant to tariff in the same manner as any other firm providing enhanced services.

b. Customer Premises Equipment

The FCC also initiated steps which will lead to deregulation of customer premise equipment. The Commission defined "Customer Premise Equipment" (CPE) to include all

carrier provided terminal equipment located on a customer's premises except over-voltage protection equipment, inside wiring, coin operated or pay telephones, and multiplexing equipment. The Commission further distinguished among "new CPE" which is CPE not in service as of March 1, 1982, and offered to consumers after that date; "federally tariffed CPE" which is CPE not contained in a carrier's state-regulated rate base; and "embedded CPE" which is tariffed at the state level.

Effective March 1, 1982, all new CPE and associated maintenance were to be separated from the carrier's basic service and offered on a non-regulated basis. All federally tariffed CPE was to be detariffed by this same date, but embedded CPE was to remain subject to state regulation pending further action in a implementation proceeding. The Bell System Companies would not be allowed to market, install, service or maintain CPE except through a separate subsidiary such as the subsidiary ("Baby Bell") through which enhanced services were to be offered.

The October 1982, decision under Docket No. 20828 extended the date for deregulation of new CPE to January 1, 1983, and excluded mobile radio equipment and transmit earth stations for mobile radios from the definition of CPE. The FCC also decided that embedded CPE (including federally tariffed CPE) in service _or in inventory_ as of December 31, 1982, could continue to be offered on a tariffed basis by telephone companies pending further resolution of the regulatory issues associated with detariffing existing CPE. Newly manufactured CPE could only be offered through a separate subsidiary (i.e. separated from the basic service charges and regulated only by competition, not by the state public utilities commission or the FCC).

c. Implementation Period

The FCC established an eighteen month transition period beginning on January 1, 1983, during which the Bell Operating Companies (BOC's) would be able to perform installation and maintenance services for CPE business systems sold by the Bell System's separate marketing subsidiary. Thereafter the separate subsidiary would be required to perform its own installation and maintenance for the CPE that it provided.

d. Premise Wiring

As a follow-on action the FCC has also issued a Notice of Proposed Rulemaking on the deregulation of premise wiring under which the dominant carriers (i.e. AT&T) would not be allowed to provide premise wiring through other than a fully separate subsidiary.

e. American Bell Incorporated

In June 1982, AT&T announced the establishment of American Bell Incorporated (ABI) to market new enhanced services and customer presise equipment. American Bell Incorporated will be the Bell System's entry into two unregulated markets: computer-augmented communications (e.g. the Bell System's Advanced Communications Services Net over which dissimilar computers will be able to "talk" to one another), and telecommunications equipment (instruments, terminals, etc.). By July 11, 1984, ABI will assume the installation, maintenance, and marketing of all CPE previously owned by AT&T or by the BOC's. ABI will be allowed to share with AT&T such services as institutional advertising, corporate planning, legal and financial services, public relations and legislative lobbying; but AT&T is to account for, and bill ABI for, use of such services in order to

protect AT&T ratepayers from footing the bill for the company's entry into unregulated markets. ABI will also pay research expenses to Bell Laboratories.[11]

C. AT&T/DOJ CONSENT AGREEMENT

The third, final, and most significant event shaping the future of the telecommuniations industry is the Consent Agreement between American Telephone and Telegraph and the Department of Justice reached in January, 1982, and ratified by the players and the Court of Appeals in August, 1982. This agreement, technically a modification of the 1956 Consent Agreement previously mentioned, modified the structure of AT&T and thereby modified the structure of the entire telecommunications industry in the United States.

1. Terms Of The Agreement

The January, 1956 final judgment in United States v Western Electric Co., Inc., et al (CA No 17-49) resulted in the following terms of agreement:

(1) Generally prohibited AT&T from engaging in any business other than provision of common carrier communications service,

(2) Prohibited Western Electric from manufacturing types of equipment other than those sold to AT&T for use in furnishing common carrier communications services, and

(3) Required licensing of certain AT&T patents.

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[11] It is interesting to note that the first attempts at commercialization by Alexander Graham Bell's fledgling company in the last century were undertaken as a manufacturing company rather than as an operating one. Instead of setting up a telephone exchange, the company offered to lease telephone instruments to customers who would be responsible for stringing their own wires to those with whom they wished to communicate.

The proposed 1982 modification would vacate the provisions of the 1956 judgment and substitute provisions requiring the divestiture by AT&T of the exchange telecommunications and exchange access functions of the twenty-two operating telephone companies owned by AT&T. The proposed modification also included injuctive provisions designed to ensure that the operating companies would not disadvantage any firm (i.e. AT&T or its competitors) engaged in the provision of interexchange telecommunications service, information services or telecommunications equipment.

In January, 1982, a request was approved for the transfer of jurisdiction in the case from the District Court in New Jersey which had heard the original case in 1956 (filed initially by the DOJ in 1949) to the District Court for the District of Columbia in which the anti-trust case against AT&T was being heard. Also, in accordance with the provisions of the Consent Agreement, the antitrust case against AT&T, _United States v American Telephone and Telegraph Company et al_ (CA No. 74-1698) was dismissed in August, 1982.

In the Consent Agreement, the Department of Justice agreed to drop its anti-trust suit against AT&T and Western Electric because DOJ believed that it would achieve more to put an end to antitrust behavior by AT&T through the Consent Agreement than it could expect to achieve even if the court decided the antitrust suit in its favor. Bell, in return, in a strategy shift more daring than anyone had thought could ever come from a stodgy dinosaur like AT&T, agreed to divest itself of its twenty-two operating companies. By jettisoning the provisions of the 1956 Consent Degree, the Court allowed the Bell System to compete fully in the new computer network and data transmission markets, and in all other non-regulated markets from which it had been excluded.

Following final approval of the Consent Agreement in August, 1982, AT&T has six months in which to submit its divestiture plans to the court for approval. The actual divestiture was scheduled to take effect within eighteen months of ratification of the Consent Agreement.

On February 28, 1983, the Supreme Court affirmed the 178-page document prepared by District of Columbia Circuit Judge Harold Green, which was the document for the final agreement in August 1982.

2. Restructuring

The basic thrust of the Modified Consent Decree is to separate local service, which will be provided by the divested BOC's, from interstate service, which will be provided by AT&T Long Lines Division and the other long distance carriers.

In accordance with the Consent Agreement, AT&T subsequently submitted to the Court of Appeals of the District of Columbia, which has jurisdiction in the case and had accepted by the Judge Greene, a proposal to create seven separate local exchange companies, each being made up of one or more BOC. Each of the local exchange companies will be comprised of several local access and transport areas (LATA) of which there will be one hundred and sixty-one throughout the country. The local companies will be required to route calls between LATA's through the long distance carriers. In accordance with the details of the divestiture proposed by AT&T and likely to be accepted in substance, no more than one hundred and sixty of the Bell System's 9884 switching stations for handling telephone traffic will remain with AT&T.

Some time prior to January 1984, AT&T will divest itself totally of ownership of the twenty-two Bell Operating Companies. After the divestiture, AT&T will still have:

(1) Its entire intercity network which provides both interstate and intrastate long distance service;

(2) Its telephones and switchboards (class 1--the twelve largest regional switchboards--through class 4--the second smallest class of switchboards in a telephone network);

(3) Its Western Electric manufacturing arm;

(4) Bell Telephone Laboratories, Inc., which does research for the Bell System; and

(5) Its International Division.

The FCC will continue to regulate long distance service, of course, of which the Bell System provides approximately ninety-seven percent in the continental United States. However, the FCC has been moving towards eliminating regulations on the smaller companies in the industry, and there are some that have predicted that if AT&T were to lose its dominant status, it also might be deregulated significantly [Ref. 28: p. 5.].

D. EFFECT ON THE TELECOMMUNICATIONS MANAGER

The industry that the telecommunications manager deals with today has taken on much of the glamour and excitement which characterized the computer industry in the 1960's. Competition for existing and for new markets is intense, and the dominant firm is being forced by government actions as well as by the competition to fight hard to maintain its market share and simultaneously to enter new markets.

The telecommunications manager can no longer afford to sit back and wait as the giants do battle. He or she must actively enten into the fray in order to reap the potential benefits that the new services and equipment can offer, and

to gain the knowledge and skill required for making the decisions which the restructuring of the industry will force upon him or her. The more the telecommunications manager understands what is going on in the telecommunications industry, the more her or she understands the requirements of the telecommunications manager's job, the more her or she understands of the options available, and the more he or she understands of sound management principles and techniques, the more he or she will be able to contribute towards enhancing the administrative efficiency of the base personnel, and to increasing the cost-effectiveness of the base telephone system.

V. THE TELECOMMUNICATIONS INDUSTRY TODAY

A. EFFECT ON THE TELECOMMUNICATIONS INDUSTRY

The effect of the Consent Agreement between AT&T and DOJ on the industry will be profound. The split-up of the Bell System will get rid of the industry's pricing structure. AT&T will no longer be persuaded by regulators to establish rates based on average costs throughout the country. Previously, as much as thirty-seven cents from every dollar generated by the AT&T Long Lines Division went to subsidize local telephone services. This was the situation which had provided the opportunity for MCI, Southern Pacific Telecommunications, Western Union, ITT, and other long distance competitors to engage in "cream-skimming" to entice customers away from the Bell System on high-volume, high-profit routes by offering rates lower than the Bell System was offering.

B. THE EMERGING BELL SYSTEM

In accordance with the Consent Agreement, AT&T will be barred for at least seven years from entering the electronic publishing business--sending news, financial and sports data, and a host of other information services to consumers on their home or office video screens. The government is hesitant to allow the dominant carrier the opportunity to determine both how such data is transmitted, to whom it is sent, and also what data is selected to be transmitted.

AT&T is also barred from any connections with the independent BOC's other than those for which it pays, and it will pay the same prices as any of its competitors.

The BOC's will get the rights to market the Yellow Pages (according to the final version of the Consent Agreement ratified in August, 1982), but AT&T is left in a position to try once again (after an unsuccessful attempt in 1978) to get authorization to market an "electronic" yellow pages.

AT&T obviously believes that its trimmed-down structure will be to its advantage in meeting the new competition in the telecommunications industry and in entering the highly competitive world of data communications equipment.

The Bell System subsidiary, Teletype Corporation, presents an example of what AT&T can do when sufficiently motivated. From its heyday when the name Teletype was synonymous with the keyboard printer and it controlled ninety percent of the market, Teletype had reached its nadir in 1973 when it had less than five percent of the burgeoning terminal market. Since then, its leadership has been passed to a former IBM executive who makes no bones that he is trying to grab as much of the market as he can by underpricing his big competitor. In 1980, Teletype's sales grew fifty percent to three hundred million dollars. [Ref. 15: p. 135].

C. THE BELL OPERATING COMPANIES

Starting September 1, 1984, the newly independent Bell Operating Companies will be required to begin the processes necessary to provide all long distance companies with access to their networks equal to that available to the Bell System at the same rates. One-third of each BOC's lines must be thus available by September 1, 1985, and equal access must be available on all lines by September 1, 1986. The BOC's will be required to provide exchange access, information access, and exchange services for such access that is equal in type, quality and price to that provided to AT&T and its

affiliates for all interexchange carriers on an unbundled, tariffed basis (other carriers may select lesser services for lower rates). After divestiture, the BOC's will charge AT&T for connecting with their systems just as they now charge other long distance carriers.[12]

Until September 1, 1987, the BOC's have the authority to order Western Electric and the Bell Laboratories to perform research, manufacturing and support services for them.

The final version of the Consent Agreement also allows the BOC's to compete in the marketing ofCPE, though they are prohibited from manufacturing any such equipment. And there is nothing in the Consent Agreement to prohibit AT&T from one day competing with the BOC's in marketing mobile, in-car telephones (which the BOC's will also be able to offer), or private telephone network service via CATV or private microwave.

AT&T must transfer to the BOC's sufficient facilities, personnel, systems, and rights to technical information (without royalties) to permit the BOC's to perform exchange telecommunications and exchange access functions, and the procurement of, and the engineering, marketing and management for, these functions. For example, the BOC's may require assistance from Western Electric in reprogramming switches manufactured by that company.

There can be no joint ownership of facilities by AT&T and the BOC's, but leasing facilities to the other party is acceptable.

The BOC's shall not provide interexchange telecommunications services or information services, manufacture telecommunications products or CPE (except CPE provided for emergency services), or provide any product or service apart

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[12] But see above, page 46, concerning access charges.

from natural monopoly services actually regulated by tariff.[13]

The divested BOC's *may* support and share the costs of a centralized organization for the provision of engineering, administration and other services. They *must* provide a centralized point of contact for the coordination of the BOC's to meet the requirements of national security and emergency preparedness. If the government or the communications industry establishes a centralized coordinating body through which all carriers are to meet national security and emergeny preparedness requirements, the BOC's participation in such an organization could constitute compliance with this requirement.

When the divestiture has been completed, the BOC's will be aligned as seven holding companies drawn from the current twenty-two operating companies:

- (1) Northeast:
  - a. New York Telephone
  - b. New England Telephone
- (2) Mid-Atlantic
  - a. Bell of Pennsylvania
  - b. Diamond State Telephone
  - c. Chesapeake & Potomac Telephone
  - d. New Jersey Bell
- (3) Southeast
  - a. Southern Bell
  - b. South Central Bell

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[13] "Interexchange telecommunications services" are not defined by the Consent Agreement. "Exchange telecommunications" means all telecommunications services within an exchange area including directory assistance. "Telecommunications services" means the offering for hire of telecommunications facilities for, or telecommunications by means of such facilities via electronic means without regard to the type of transmission facilities used. "Local exchange facilities" include inside wiring provided under tariff by the BOC's.

(4) Great Lakes
    a. Illinois Bell
    b. Indiana Bell
    c. Michigan Bell
    d. Ohio Bell
    e. Wisconsin Bell
(5) Southwest
    a. Southwest Bell
(6) Northwest
    a. Mountain States
    b. Northwestern Bell
    c. Pacific Northwest Bell
(7) Pacific
    a. Pacific Telephone and Telegraph
    b. Nevada Bell

With some exceptions, the pictures of the BOC's which will emerge from the divestiture process does not appear overly rosy. From the outset, their exclusive franchises will be under attack by the private communications networks via CATV, by cellular mobile telephone networks, and by digital communications systems. They will have forty-five to fifty percent debt to equity ratios which, though not unusually high for a public utility, will hurt their Standard and Poors bond ratings, and, most probably, make raising money for capital expenditures more costly. Also, the BOC's will begin their new lives strapped with the oldest pieces of equipment currently in the Bell System inventory.

The BOC's will be able to sell their technical and coordinating skills to other telecommunications systems and/or users, and will be able to form new business relationships with non-AT&T long distance carriers and equipment suppliers. For example, the BOC's may provide billing and collection services for long distance carriers and collect a fee for providing this service.

The BOC's will be able to enter the business of supplying telephone equipment, but may not manufacture the equipment which they sell. The Bell System's ABI will be a competitor and there will be little incentive for the BOC's to strengthen a competitor by buying from Western Electric.

D. THE INDEPENDENTS

Chapter One discussed some of the maneuvering which has already begun as competitors fight to fill the cracks opened up in the industry by the Computer Inquiry II Decision and by the Consent Agreement. That was only a small sample.

Similar maneuverings have been going on since the FCC began its move towards deregulation with the MCI Decision. The Specialized Common Carriers such as MCI, SPRINT, etc., began by catering to businesses, but since their systems were laying idle after business hours, they devised home service packages for non-peak hours use, and they were soon confidently predicting that they would have their services available to ninety-five percent of the telephones within the continental United States by mid-1982.

Also, since December, 1982, the international common carriers (ITT, Western Union International, RCA Global Communications Inc., FTC Communications Inc., etc.) have had authorization to offer voice services in competition with AT&T International.

E. EFFECT ON USERS

Even those most optimistic about the effects of the current restructuring of the telecommunications industry predict increases in the local rates. AT&T speaks conservatively of eight to ten percent increases while some of the more pessimistic analysts in the industry predict rate increases of two to three hundred percent within the next

five years. In January 1983, Pacific Telephone and Telegraph filed a tariff for 1984 with the California Public Utilities Commission requesting a rate increase of more than eight hundred million dollars, more than doubling its lowest rate--from seven dollars to fifteen dollars. Because tight control by the California Public Utilities Commission has kept the profitability of Pacific Telephone and Telegraph low and resulted in its being the least financially sound of the twenty-two local Bell telephone companies, such a large rate increase request is probably atypical. Southwestern Bell has filed a request with the Missouri Public Services Commission for a twenty-five percent rate increase to go into effect January 1, 1984, stating that the company is seeking the rate increase because of the divestiture. A Southwestern Bell spokesperson stated that residential customers have been paying less than half of what it really costs to provide local telephone service. The requested rate structure would nearly double the change for residential single-party lines in the St. Louis and Kansas City areas [Ref. 29]. Rate increases by companies which found themselves in situations similar to that in which the BOC's now find themselves [Ref. 30], have an omminous ring for the consumer.

Users can expect a shift to usage-sensitive pricing for telephone services, a procedure which will more accurately reflect the cost of providing the particular service. For example: a measured local rate could be imposed on all calls whereby charges are based on the length of the phone call and the time of day in which the call is made (currently, eighty-eight percent of Bell's residential customers pay a flat rate no matter how many telephone calls they make). Such message unit accounting may or may not be an advantage to the user, depending on his or her usage patterns.

Users will also experience a change in the rates charged for installation and servicing. The Bell System companies have never had to accurately determine what these functions cost, but neither have they had to try to control these costs. Without accurate data to determine costs and to keep them minimal, the Bell companies will not be able to compete with the rest of the firms in the industry.

With the loss of subsidies from the long distance business after the divestiture, other important changes may be expected in the local service rates. Rural subscribers will find costs increasing substantially which may lead to an increase in private customer mini-networks on and around remotely located military bases. Installation and repair rates charged by the local telephone companies will come closer to reflecting what it actually takes to pay increasing wages to technicians which should lead to increased availability of third party warranties and repair contracts and more decisions to replace telecommunications equipment rather than have it repaired.

In order that the base may be able to keep ahead of the changing telecommunications industry and the changes which are rapidly reshaping it, and to be ready to take advantage of the opportunities which present themselves it is necessary not only to understand the industry, but also to understand how the industry changes are affecting the job of managing a telecommunications system, to be flexible enough to cope with the fluctuations which will take place as the industry continues to evolve, and to recognize the increased scope of responsibility of the telecommunications manager. These issues will now be addressed.

VI. STRATEGIES FOR THE 1980'S

A. CHANGING ROLE OF THE TELEPHONE/COMMUNICATIONS MANAGER

When Westinghouse Electric Corporation decided in 1980 to speed up communications between employees in the forty-five offices and factories near its Pittsburgh headquarters, it budgeted twenty-six million dollars to build a new type of network that could handle electronic mail and video teleconferencing as well as all interoffice telephone calls. The move catapulted Robert E. Bennis, manager of communications systems, into a position of new prominence within the giant corporation. Although he had been essentially a purchasing agent--buying services from AT&T--Bennis now had to oversee the construction of a sophisticated telecommunications network which, when completed, will amount to a private telephone company.

His experience is not unique. Today, telecommunications managers are finding that instead of working solely to control costs, they are being asked to provide a service that will help the organization run more efficiently, more effectively, andmore economically; and executives are asking very pointed questions and expecting accurate answers from their telecommunications managers as the executives grapple with the need to choose from a broad selection of equipment and services in deciding how best to fill a company's communications needs. Gone also are the days when the telecommunications manager had little need to conduct financial analysis because equipment was available only on a rental basis from AT&T, and there was only one long distance carrier.

The major perturbations in the telecommunications industry described in the previous chapters have created an unsettled environment for the customer. For the military base commander and for the base telephone/communications officer, careful planning and management will prove extremely advantageous for coping with this environment. The job of the military base telephone/communications officer has become an expanded, complex job which requires employment of the sound management techniques of a telecommunications manager. By crafting his or her strategies and tactics well, the military base telecommunications manager will be able to significantly enhance the administrative efficiency of the base personnel, and may be able to dramatically reduce the strains telecommunications services and equipment are now placing on the command's budget. Conversely, whether the military base telecommunications manager chooses to accept this new management role or not, he or she will be in a position to bring about drastic reductions in the administrative capabilities of the base, and to create even greater strains on the budget by failure to employ sound management techniques.

E. PROCEDURES

1. Current Procedures

The procedures previously followed in obtaining telecommunications services and equipment for the military base and its tenant commands have been relatively straightforward and basically similar for all the different services. While the Army and the Air Force have Signal Corps, communities of officers and enlisteds who devote their entire careers to communications, the Navy, Marines, and Coast Guard do not have similar dedicated career specialists. On bases belonging to the latter services, the

telephone/communications officer is part of the Public Works Organization. Regardless of the internal organization of the base, the telephone/communications officer has obtained non-critical services and equipment in the past by simply contacting the local phone company representative or the AT&T representative and ordering the required items using a standard communications services authorization (CSA). Whichever organization, the local telephone company or AT&T, received the order would in turn deal with the other parties of the Bell System to implement the request.

The telephone/communications officer was able to obligate up to one thousand dollars towards such procurements. In order to procure services or equipment above the one thousand dollar threshold, the base telephone/communications officer would have to send the communications services authorization request to the next eschelon. For the Army this would be the United States Army Communications Command at Fort Huachuca, Arizona; for the Air Force this would be the United States Air Force Communications Command at Scott Air Force Base, Illinois; for the naval services this would be the regional Naval Engineering Facilities Command.

For long distance services (direct dial), switches, entrance services, etc., the communications command would contact the long-distance carriers who would research the requirement and advise the command whether it would be cheaper to go to the local phone company to get services to the long distance carrier's switch, or whether it would be cheaper for the Defense Commercial Communications Office (DECCO) at Scott AFB to procure the service via a general contract. Long distance services other than common carrier direct dial were obtained in a similar fashion. WATS lines were procured by the military base telecommunications manager or by the next eschelon in accordance with the applicable amount of procurement costs.

Operationally critical circuits were obtained by other agencies. AUTOVON and dedicated long distance services were procured for all the services by DECCO and distributed to the various services according to their expressed needs. Federal Telephone System (FTS) circuits were procured by the General Services Administration (GSA).[14]

For all but the largest procurements, the base communications officer used the communications services authorization (CSA), based on the general standing contracts which the communications commands, engineering commands, or DECCO have previously arranged. Under the CSA concept, contracts awarded for leasing telecommunications services covered end-to-end service.

2. Circuit Control

Currently, there is a controlling company for every circuit. If there is any problem, the user can call the controlling company, log-off the circuit, and the controlling company will find the problem, get it fixed, and notify the user when the circuit was again operating.

3. DECCO Interim Procedures

Recognizing the import of the FCC Computer Inquiry II Decision (and perhaps anticipating the AT&T/DOJ Consent Agrement), DECCO at Scott AFB, Illinois, issued a letter in 1981 giving preliminary advice concerning the ramifications

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[14] AUTOVON (automatic voice network) is the world-wide voice system of the U.S. Department of Defense. High quality trunks are used and different grades or priority pre-emption are provided. AUTOVON also carries some message-switched digital record message traffic [Ref. 4].

FTS is a U.S. government communications system administered by GSA, which covers the 50 states, Puerto Rico, and the Virgin Islands, and provides services for voice, teletypewriter, facsimile, and data transmission [Ref. 4].

of the changes in the telecommunications industry to the various service communications commands [Ref. 31]. Since the military base telecommunications manager will be pursuing many of his acquisitions through these commands, it will be instructive to review the conclusions and recommendations contained in this letter.

As a result of the FCC Computer Inquiry II Decision, DECCO concludes:

(1) All new, deregulated CPE is by definition eligible for competition in the absence of specific sole source justification to the contrary.

(2) Embedded equipment and equipment in the telephone companies' inventories as of December 31, 1982, can be offered under tariff until all CPE is deregulated.

(3) All major CPE used to provide enhanced service is now to be considered eligible for competition and the appropriate procedures for securing competition stated in the Defense Acquisition Regulations (DAR) must be followed.

(4) For requirements which will result in a total obligation of in excess of ten thousand dollars ($10,000), unless the customer can provide detailed justification explaining why only a sole source can provide the equipment or service, the customer must submit a performance specification with the telecommunications service request (TSR) in order that DECCO can properly synopsize the requirement for publication in the Commerce Business Daily and issue a formal solicitation to industry.

(5) While the customer may feel less than qualified to write a DAR performance specification, DECCO considers it the key to good acquisition action. It is the base upon which proposals are developed and offered, negotiations conducted, the contract awarded, and criteria set by which the government can determine if stated requirements will be met. A poorly written performance specification can mean disaster for the customer and many headaches for the contracting officer.

DECCO suggests five functions which are satisfied by the performance standard:

(1) It communicates to industry what is required to be responsive to the solicitation;

(2) It serves as the basis to technically evaluate alternative solutions offered by industry to meet stated requirements;

(3) It serves as the foundation for either accepting or rejecting delivered supplies or service;

(4) It serves as the basis to determine if equipment performs correctly once in service;

(5) It defines what the government should be getting for what it is spending.

DECCO's letter offers the following guidelines to supplement the DAR instructions for preparation of these specifications:

(1) The performance specification should be written in clear, unambiguous terms. Verbiage should be critiqued for meaning prior to inclusion. If a particular

description is unclear, it should be rewritten until there can only be one reasonable interpretation by all parties.

(2) A middle-of-the-road attitude must be taken with regard to flexibility. If the performance specification is too broad the contractor may deliver a product that does not satisfy the customer's needs, but the government may be forced to accept it. Conversely, rigid, restrictive parameters inhibit a contractor's creativity and innovative effort, restrict competition, and may result in sustainable protests.

(3) The performance specification should be written in conventional language to the extent possible without sacrificing the technical specifics needed to define performance parameters. Frequently, diagrams or schematics which illustrate how and where desired equipment will operate and what it must interface with are helpful.

(4) Properly dated and pertinent reference documents should be attached to the performance specification, or a statement included to advise where such documents can be obtained.

(5) The user should determine if military or federal specifications are applicable and available.

(6) General and background information should be clearly separated from directions and contractor responsibilities.

(7) The period of performance or delivery schedule should be accurately specified in terms of dates or elapsed time.

(8) Proper quantities must be shown.

(9) The user should determine if the equipment will produce results consistent with project objectives.

The user, when acquiring major competitive CPE, must also furnish DECCO with a technical evaluation plan tailored to the performance specification to include the following:

(1) The basis for award which is the framework within which the government intends to evaluate proposals and award a contract.

(2) A list of evaluation criteria (factors and subfactors) and their relative order of importance.

(3) A narrative description of what the government expects to review within the factors and subfactors.

(4) Identification of any factor or subfactor of such a critical importance that an unsatisfactory rating could render a proposal technically nonresponsive.

(5) Information to offerors on the format and content of offers or proposals needed for evaluation.

(6) Information for the contracting officer such as technical evaluation techniques, rationale for evaluation factors, and specific weights (if any) to be assigned to the factors and subfactors.

(7) Anticipated system or equipment service life.

(8) Information as to whether or not a purchase option is desired and how it will be evaluated.

4. Changing Procedures

The first issue to confront the military base telecommunications manager is the lease or buy decision for the currently in place CPE and inside wiring. These items may either continue to be leased as they are at present, or they may be purchased from the local telephone company outright. The longer the telecommunications manager waits to purchase telecommunications equipment, the more expensive it will be.[15]

In the near future, the Naval Facilities Engineering Command, the second eschelon procurement organization for the Navy, will develop general service agreements (requirements contracts) by which the military telecommunications manager can order ordinary terminal equipment. Other services can be expected to follow similar routes. The general service agreements will identify all ordinary equipment and the estimated quantity required. The bidders will respond to two line items on each type of equipment: one line item reflecting installation costs, and the other reflecting yearly lease/service charges. Recurring lease/service charges will either be renegotiated annually, be adjusted based upon economic price adjustment provisions, or be pre-priced for the optimum years. GSA's can be used to acquire service, but not to acquire equipment or inhouse wiring.

Complex equipment not covered by the general service agreements (e.g. electronic automatic PBS's and special assemblies) will be competitively procured on an individual basis.

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[15] This assumption is based upon several years of spiralling inflation, the initial requests for rate changes based on divestiture, and the BOC's initial offers to customers to allow them to purchase equipment. A good manager will keep abreast of the trends and will make judgments based on current information.

The telephone companies can offer equipment for sale, but must compete with other suppliers. Even if the equipment is installed and maintained by the telephone company separate (non-tariff) charges will be levied. The telephone companies will probably not allow any customer to mix another company's terminal equipment with equipment leased from them.

C. RESPONSIBILITIES

1. Total Systems Perspective

Each circuit other than a strictly local one will be an amalgamation of several networks and possibly several equipment suppliers. Maintaining records of each circuit will be mandatory for the telecommunications manager who will quite possibly be the only one who has the incentive to keep track of the big picture. He or she must be capable of asking and answering the questions which will arise when a circuit goes out: Whom do I talk to when a circuit has an outage, the Long Distance carrier, the local exchange telephone company, the terminal equipment vendor, a third party maintenance contractor, or whom?

2. The Cuban Refugee Crisis

An excellent example of the kind of planning and action during a crisis situation which, in the future, may involve the military base telecommunications manager was clearly shown by the Bell System mobilization during the Cuban refugee crisis in 1980. As the influx of refugees burgeoned to critical proportions, the United States Army Communications Command in Arizona contacted AT&T to ask the Bell system to conduct a review of availability of telephone communications capabilities at potential relocation sites. The AT&T Long Lines Manager at Sierra Vista, Az. was the

designated Bell System point of contact with various AT&T offices alerted to provide support and interaction with other government agencies. Initial estimates were that one hundred and twenty-five circuits would be required in Arizona at Fort Chaffee--with only twenty-five available at that time. In less than a month the requirements had swollen to two hundred and sixty circuits.

In Pennsylvania, at Fort Indiantown Gap, the telephone system garnered resources and installed a one hundred and twenty channel microwave radio system in only four days.

At Fort McCoy in Wisconsin, Wisconsin Telephone Company (Bell System) was recruited to install facilites for Northwest Telephone Company, an independent telephone company. The existing buried cable servicing the Fort McCoy area was defective and Northwest Telephone did not have the personnel required to do the repair job in the week-to-ten days required. One hundred Wisconsin Telephone workers worked over the Memorial Day weekend to replace the defective cable. Their efforts included installing thirteen miles of cable which was diverted by Wisconsin Telephone from another Bell System Company, Illinois Bell.

3. The Federal Emergency Management Agency

With the break up of the Bell System and until the BOC's establish a functioning central coordinating organization, coordinating any such future operations involving military bases may involve talents of the military basetelecommunications officer working in cooperation with the military communications representative assigned to the Federal Emergency Management Agency.

The Federal Emergency Management Agency (FEMA) was established in 1979 to coordinate all federal, state, and local preparations for response to and management of any disasters--natural or man-made--including the consequences

of war.[16]

The key word is coordinate. All the various federal agencies must have national security/emergency preparedness plans which FEMA, in turn, will coordinate. Each of the ten FEMA regions has a Military Communications Representative designated by the appropriate Military Area Commander to serve, when required, on the Emergency Communications Staff to advise on the military capability for providing communications support in a disaster area, and to supervise the operations of such support when required [Ref. 50].

The military base telecommunications officer should establish liaison with the FEMA Military Communica-tions Representative to ascertain the types of information that would be required in a disaster situation should use of base facilities be required, and he or she should rehearse various scenarios and have a good idea of the options which he or she would be called upon to exercise.

D. RESTORATION PRIORITIES

In addition to being prepared to make the base telecommunications facilities available in case of disasters, the telecommunications manager should have a well-defined plan of restoration priorities should the base suffer a massive outage of its telephone circuits. In formulating such a plan he or she must know not only the Base Commander's priorities, but also the topography of each circuit and the points of contact as the various telephone companies which provide facilities utilized by each circuit. Previously, one contact with the Bell System representative would set in

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[16] In addition to coordinating federal, state and local government agencies, FEMA runs the civil defense program, the continuity of government program, the strategic stockpile, the emergency broadcast system and natural hazard mitigation programs like flood plain management.

motion the troubleshooting and repair process necessary to restore a down circuit. Whether or not such a one-step procedure (from the telecommunications manager's viewpoint) will still be available after January 1984, remains to be determined and will probably be different for different types of circuits.[17]

To be prepared to meet any eventuality, the military base telecommunications officer should envisage a scenario in which each company will troubleshoot and be responsible for only its part of the circuit, and any liaison beyond the limits of the particular company will have to be accomplished by the telecommunications manager.

Management of overloaded circuits will present the telecommunications manager with similar problems. In high usage situations, centralized management of the network will be critical as calling volumes load, and then overload trunk group capabilities--the Mother's Day Effect. Controls (managerial and/or technological) will be required to keep the networks functioning at maximum efficiency to ensure the completion of the greatest number of calls including the highest priority calls. Stored program controlled switches and high-speed signalling systems can give the telecommunications manager a much larger span of control.[18]

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[17] The Secretary of Defense has promulgated the procedures for an NCS Circuit Restoration Priority System in National Communications System Memorandum No. 1-68 [Ref. 33].

[18] Stored Program control (SPC) is: 1. Control of an automatic switching arrangement in which the call processing is determined by a program stored in an alterable memory; or, 2. control of a function by sequentially interpreting information stored in a mamory whose structure is independent of the function to be performed [Ref. 4].

1. Multiple Contracts

Given the new structure to the telecommunications industry, and the extensive competition between firms and products within that industry, the likelihood that the telecommunications manager will be managing several contracts for equipment, services, and maintenance simultaneously is very great. Although he or she may view the base telecommunications facilities as a single system, the suppliers of the various parts will look upon themselves as autonomous. The management challenge for the military base telecommunications manager will be to orchestrate the contracts and to create order out of chaos.

2. Know Resources And Where They Are

The Cuban refugee crisis is again illustrative of the types of advanced planning which will be required and the knowledge of resources necessary for the military base telecommunications officer. In Wisconsin one hundred and thirty-five (135) Federal Telephone System (FTS) circuits were installed at Fort McCoy. The nearest FTS location capable of handling that number of additional services was the GSA switchboard at Chicago, Illinois. Four (4) AUTOVON lines were also terminated at the Chicago GSA switchboard. These lines came from the AUTOVON switch as Roscommon, Michigan. Sixty (60) business lines were installed at Fort McCoy from Sparta, Wisconsin, by the combined efforts of the Monroe Country Telephone Company and the Wisconsin Telephone Company.

To meet the suddenly, drastically increased demands, Wisconsis Telephone hired and quickly trained more than one hundred bilingual operators from the University of Wisconsin at Eau Claire, and from the Spanish-speaking community in Milwaukee.

Sixteen (16) key systems and one hundred and eighty-five (185) stations were installed at Fort McCoy by Wisconsin Telephone Company personnel because the Army could not provide the equipment and the personnel in time to be ready for the refugees.

A point of contact at each company and at each agency had to be established to achieve the required total team effort between the military, the various Bell System groups including the local companies, AT&T Long Lines and Western Electric, and several independent companies in order to turn inactive military installations into cities of fifteen thousand inhabitants, almost overnight.

In this crisis orders were handled verbally with written confirmation after the services were in and working. The principal players knew each other and followed basic day by day procedures, albeit informally.

Potential locations for new facilities should be indentified and a probable sequence of activation established. An inventory of existing local access facilities and on-base cables and equipment should be maintained. The type and amount of emergency facilities that would have to be installed should be identified. Points of contact at companies which may be required to provide services should be identified and nurtured.

E. COMPLEXITIES

Not only is the telecommunications industry increasing in complexity, but also the job of the military base telecommunications manager is increasing in complexity--so much so that in this thesis the job position has been given an entirely new title. This chapter has pointed to only some of the new and changing facets of the job which may not have been apparent or extant before the recent changes in the

industry. A third area of increased complexity is the breath of choices which are now available to facilitate base administration and to reduce telecommunications costs. Some of these choices will now be explored.

VII. AVAILABLE OPTIONS

A. PRELIMINARIES

1. The Local Telephone Company

Commencing January 1, 1984, the local telephone company will provide only the dial tone--what the telephone industry calls POTS, plain old telephone service. The telecommunications manager will be forced to make separate arrangements for all additional services and equipment.

2. Selected Examples

It is not the intention of this paper to present a complete shopping list of telecommunications equipment and services available to the military base customers. Such a list would be out of date almost as soon as it were written. What will be done will be to provide several examples of the more recent and innovative developments in telecommunications in order to give an idea of the options available. These examples will be given so that the military base commander and base telecommunications manager may realize that there are indeed a myriad of telecommunications equipments and services which can significantly enhance base administration, and, therefore, should not be ignored. There are more than one hundred suppliers in the telecommunications industry each of which is ready and willing to provide unique solutions to the military base telecommunications needs.

B. ACQUIRING TELECOMMUNICATIONS EQUIPMENT

1. Equipment Selection

The fact that recent telecommunications equipment expositions have been held in Las Vagas is symbolic of the atmosphere of excitement and high competition which now exists within the telecommunications industry. The pages of the industry journals such as *Telephony*, *Telecommunications*, and related publications such as *Administrative Management*; business magazines such as *Wall Street Journal*, *Business Week*, and *Forbes*; *and newsweeklies such as Time*, *Newsweek*, and *US News and World Report*; regularly report on new developments in the industry and new innovations spawned by the recent era of high competition.[19]

2. Equipment Options

a. Inside Wiring

Although wiring is obviously not an option, selection of the company which installs and maintains inside wiring is an option and will be a required choice after January 1, 1984 (unless military maintenance personnel are assigned to the base). Selection of the correct company and type of wiring (e.g. twisted pair, coaxial or fiber optics) will significantly affect system installation and maintenance costs, and will also affect the system's ability to accept future equipment and service options.

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[19] Appendix A contains a partial list of telecommunications related journals which will be of assistance to the base commander and to the telecommunications manager in keeping in touch with new developments within the telecommunications industry.

Under the rules of deregulaton, the customer will pay for all new inside wiring plus maintenance. However, in at least one state, California, the Public Utilities Commission has given Pacific Telephone and Telegraph approval to authorize the government to continue using the company-owned wiring at no additional cost. Pacific Telephone and Telegraph will retain ownership of all other distribution wiring at military bases. This action will then create a maintenanace or repair charge to military services such as the Navy which do not maintain their on-base telephone equipment or inside wiring [Ref. 34].

b. Instruments and Terminals

Even though they are more expensive at the present time, pushbutton telephone instruments (Touch-Tone is a registered trademark of AT&T), are nearly mandatory for access to the many advantages the new era in telecommunications offers to the telecommunications user. At the present time, such instruments are required for access to other than AT&T long-distance carriers (rotary dial phones can be used only if a converter is purchased or rented for each instrument), and for access to special features such as electronic mail, stored program control, etc., available from computerized switches.

A typical example of recent advances on the pushbutton telephone instrument is American Bell Incorporated's Genesis Telesystem, a recently unveiled computerized telephone instrument for home and small-business use with features such as storage of phone numbers, automatic dialing, a private seventy-five name personalized telephone directory, and a display screen which shows the number dialed and how long the caller has talked. The Genesis Telesystem is designed so that optional cartridges can be plugged in to provide additonal features as new software is developed. [Ref. 35].

c. Stored Program Control

Stored Program Control was developed in the 1970's and is now coming into extensive use. Using special software located in the telephone company's central office switchboard, stored program control offers greatly increased flexibility to users by providing features such as pre-dialed numbers, available by pressing only one or two numbers on the instrument, voice-activated dialing, and non-simultaneous store and forward programs through which the user sets up the call and records the message using the central office facilities, leaving instructions to actually complete the call at a later time.

Stored program control also provides for central office answering with remote retrieval and even revision of the message, by entry of special code numbers entered from a pushbutton key pad, or, when only rotary equipment is available, by use of a special tone generator. The user can phone his or her own number and hear a list of all the numbers from which he or she has received calls during his or her absence, cue the stored program control to receive messages during conferences, or screen calls by entering into central memory the numbers of phones from which he or she will receive calls. All other callers would then receive a busy signal or a recorded message. The user may also have the option of having the number of the caller displayed before accepting the call. Stored Program Control can also be utilized to set up conference calls, and to allow the user to accept an additional call without disconnecting a call in progress.

d. Direct Entry

Direct entry of information from key pads into central computer systems could be a simple and effective method for placing orders for parts into a supply system computer, for electronic transfer of funds, and for bill paying to creditor's accounts.

e. Videotext

Videotext is a rapidly expanding multi-faceted user service which allows the user to use a data entry terminal and a television set to call up information stored in many central data bases and display it in text or graphic form. It is simple to operate, uses only inexpensive, non-intelligent terminals, allows convenient access to up-to-date information, and permits effective interaction between the user and the supplier of the information. Storage cassettes enable the user to store the data retreived for future reference.

f. Facilities Management Systems

Tele-Alarm services which can provide for management of energy systems, protection systems and fire and flooding alarms are also feasible with sensing systems which work through the user's phone wiring. These sensing systems are continuously polled by a central office computer which detects any alarm condition and automatically alerts with a tailored message a predetermined roster of people who can deal with any emergency which develops. Tele-alarm services are available with American Telephone's Dimension PBX as well as with many other PBX systems.

g. Bell Telephone's Dimension System

In addition to the tele-alarm service, the AT&T Dimension analog system has several recent enhancements. It now features a distributed communications system capable of handling up to twenty-five thousand stations in a unified system. It now has 9.6 kilobit data switching to handle voice and data through the same switch. When coupled with sophisticated management reporting systems, it can provide call management and automated call distribution, and it can provide message center service and message center directory to expedite incoming message handling.

C. ACQUIRING TELECOMMUNICATIONS SERVICES

1. Selecting Services

Discerning the advantages and disadvantages of the new telecommunications services which are available today, or which will be available in the near future, will be a challenge to the military base telecommunications manager's knowledge and vision, as the new services will offer novel ways in which the advances in telecommunications technology can serve to enhance the administrative efficiency of the base personnel. Key decision makers can be made more accessible, they can gain greater access to up to date information, and that precious commodity, time, can be better utilized at high-tempo establishments. Short-term expenditures can lead to long-term financial savings through selection of the right new services. It is in the area of telecommunications services where the military officer can transform his role from that of order taker, reacting to the demands of others, to manager, providing an efficient, cost-efficient telecommunications system.

2. Service Options

The items below form a partial listing of the various telecommunications services which the telecommunications manager may wish to make available to the users at his or her base. Due to the dynamic nature of the industry, it can be anticipated that this list will change rapidly in the near future.

a. Message Telephone Service

Message Telephone Service (MTS) is the familiar dial-up service rendered on a local exchange basis or on a long distance or toll basis. This is the bread and butter of any telecommunications system.

b. Dedicated Circuits

In contrast to MTS are the dedicated circuits which are leased to the communications service subscriber on a private or exclusive basis for the transmission of voice, data, facsimile, video or a combination of these.

c. Community Antenna Television Cable

In remote areas where conventional telephone transmission facilities are limited, another option may exist, that of community antenna television (CATV) cable. Where installed, CATV cable offers an excellent broad-band transmission medium capable of providing almost any type of telecommunications service. CATV may be a very viable method by which to expand telecommunication capabilities at military bases in rural areas.

Indeed, CATV cable may be an attractive alternative to conventional transmission media even in urban areas. New York City has been purchasing lines from Manhattan Cable TV Inc., and hopes eventually to set-up a private

communications net using cable TV lines to link all of its City offices.

d. Call Forwarding

Call forwarding is a service feature, usually available through the phone company central office switching system, whereby calls can be rerouted automatically from one line to another or to an attendant. This service can be combined with local beeper paging services when the user is in areas away from his or her home office.

e. Telephone Answering Services

Telephone answering facilities can be either services, devices, or a combination of the two. Automatic answering machines capable of answering calls and delivering a recorded message are available for less than one hundred dollars. More expensive devices beep the caller so a message can be recorded. The most sophisticated (and hence, most expensive) devices have features such as delivery of stored messages to a traveling user, longer tapes to store more messages, lost-call counters and similar bells and whistles.

Local answering services offer a less expensive way to receive messages when the user is not in his or her office. When leaving the office, the user initiates the call-forwarding feature of the telephone system by dialing two digits which will elicit a beep after which he or she dials the number of the answering service. When the answering service answers, the call forwarding has been put into effect. Thereafter, all calls arriving on the first line of the user's group of incoming lines will go to the local answering service.

One drawback to the use of a local telephone answering service is that the service operators do not have any way of knowing which phone is ringing, so they are forced to resort to answering with simple phrases such as "May I help you?". If the base is large enough to support it, and the need is sufficient, the telecommunications manager may want to set up a base telephone answering service to smooth the answering process and to reduce costs.

A third answering service option is a special "800" inward WATS service such as that offered by the Cincinnati firm, Execucall. Users are assigned a special four-digit extension number. Callers dial the special "800" number, ask for the extension number, and leave their messages with the operator. The operator may be given special instructions by the user to have certain type of callers given information about how to get in touch with the user in emergencies, etc. The user may use this service to retrieve messages left by callers and by his or her own staff without returning to the office.

f. Office Computer Networks

Office networks supplied by computer vendors connected to PBX's can now provide an economic alternative to phone lines currently installed. After doing a cost comparison that showed it could save sixty-five million dollars over the next ten years, Westinghouse Electric Corporation decided to install its own private network between its forty-five offices in the Pittsburg area.

g. Private Networks

Last summer, Satellite Business Systems, a consortium of IBM, Aetna and COMSAT, announced that it was entering the voice-only market. This gives the user yet one more way around the local telephone system by using a

combination of satellites, SBS earth terminals, microwave relays, and customer owned/leased termination equipment to set up the user's own private network.

SBS also offers a wideband service between scattered users in the same organization which integrates all-digital transmission of telephone conversations, computer data, electronic mail and video teleconferencing. And SBS offers a high-speed facsimile, which delivers one letter-size page per second.

AT&T has recently unveiled a terrestial digital service for high volume users which will provide a mixture of voice, data and facsimile transmission, and, with additional equipment, video transmission.

h. Electronic Mail

Although the concept of electronic mail has not yet been developed for military applications, it is probable that the advantages it offers for reducing letter and memo processing and transmission costs, for reducing military record message traffic, for providing an alternative route for low priority traffic, and for offering important users a fast, efficient method of communications, will soon lead to its adoption. The forthcoming Digital Data Network 1 will offer the option of electronic mail to its users with the added benefit of cryptographic security. The development of smaller, smart terminals solely for the handling of electronic mail would be a logical outgrowth of the system.[20]

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[20] Digital Data Network 1 is a wartime survivable, secure, dependable, and affordable common user data communications network which is designed to meet all the present and planned computer network requirements of the Department of Defense. Based on established data network technology, Digital Data Network 1 will connect up to ninety-one physically separate computer networks operated by Department of Defense units organizations. Implementation is scheduled to begin in fiscal year 1983 and the network is scheduled to be in full operation by the end of fiscal year 1986.

In a typical electronic mail system, terminals distributed throughout an organization are linked to either a central or distributed computer system, or a combination of both, to handle mail processing, store-and-forward functions, and text management over communications lines. Such a system enables the user to access his or her electronic mailbox through a computer terminal, and to send information from the terminal to other subscribers [Ref. 36].

One government agency, the Food and Drug Administration (FDA), has already switched from a government teletype system to a computer-based message system in its offices nationwide, and thereby has achieved cost savings and ease of communications. The FDA estimates that it is saving about a million dollars a year by using the electronic mail system, including savings on personnel, equipment rental, and teletype leased lines and message charges. The FDA's new system also virtually eliminates "telephone tag", the buzz-word for the difficulty frequently experienced in trying to connect with the right party over the telephone. This sometimes seemingly endless process of call-up/call-back is never a problem with an electronic mail system. And, according to Herb F. Klein, Director of the Office of Resource, Planning and Management at the FDA Office in Rockville, Md., "...the volume of information handled by this system surpasses what the TELEX, regular mail or any other standard method could..." [Ref. 36].

The FDA's system utilizes existing communications word processors to prepare messages which are transmitted through a host computer directly to electronic mailboxes located in offices in all fifty states. The computer-based message system of the FDA has either local or off-site access which allows messages to other users or memos for one's self to be sent from the user's home phone to the office electronic mail processors.

i. Facsimile Transmission

Facsimile transmission is an electronic communications process whereby exact copies of printed, written, and/or graphic material are sent and received over standard telephone lines. This process virtually guarantees error-free messages. The sending machine electronically scans a document and sends a corresponding signal over public telephone lines to a receiving machine that decodes and converts the signal into a hard copy facsimile.

Facsimile can be utilized to transmit hand-written orders, complex tabular data, and maps or charts. It requires a fairly wide bandwidth, but black and white copies can be transmitted satisfactorily over voice-grade circuits. Transmission times of thirty seconds to two minutes are typical, but should be improved upon in the near future.

j. Voice Mail and Message Systems

One expert has estimated that it takes an average of six phone calls to get the right parties together on the telephone [Ref. 36: p. 43]. A recently-developed innovation designed to reduce telephone tag and also to reduce the need for certain forms of written communications such as interoffice memos, interoffice electronic mail, and other short-lived, one-way communications is the Voice Mail and Message System. [Ref. 37]. These systems are built around dedicated, large-disk mini- or microcomputers with large storage capabilities.

When a caller wants to leave a message, the system's voice, which has been recorded and stored in digital form, asks the caller to enter his or her code by pressing the appropriate buttons on a standard pushbutton phone and then entering the mailbox number of the recipient

(or recipients--these voice messages can be broadcast to many locations). Once this information has been entered, the caller dictates the message by speaking into the phone.

The system's digitized voice prompts the caller throughout the process, providing guidance on how to proceed. When the message has been completed, the caller's voice is immediately digitized and stored on a computer disk. It is then available to the recipients when they call-in for messages.

With the voice mail or message system, the caller is able to:

(1) Store a message in a voice mailbox which the calling party can access from any pushbutton phone;

(2) Broadcast a single message to more than one recipient;

(3) Specify either immediate connection with the called party if the person is available, or designate a delivery time for the message;

(4) Ensure message confidentiality with passwords;

(5) Delete long pauses;

(6) Retransmit the received message with added comments; and

(7) Receive his or her mail at remote locations.

With such a system duty officers could file a running log of a crisis situation which would be available to officers who could not be at the scene, reconnaissance units could file intelligence reports, and secretaries could prepare memos to brief bosses who are out of the office.

D. CELLULAR MOBILE RADIO TELEPHONE SYSTEMS

An up-and-coming complement and/or competitor to the local telephone system is the cellular mobile radio telephone system. Such a system will consist of three hundred and thirty-three channels in the three hundred megahertz frequency band. Each metropolitan area will be divided into twenty or more grids or cells, each of which will have a receiver/transmitter--called a cell site, base site, or base station--which will provide communications with the mobile and portable units in the cell. Each base station will be connected to a central Mobile Switching Office which will be connected to the local telephone system. By cell-splitting and frequency re-use in non-adjacent cells, considerably more than three hundred and thirty-three users can be accomodated, and the FCC's requirement that two systems--a telephone company and a radio common carrier with identical capabilities--be available in each market, also promises to further increase service capacity in a particular geographic area [Ref. 38]. (New York City may eventually have as many as two hundred and fifty thousand car phones, according to one estimate.) In June of 1982, when the FCC opened up applications for the thirty major metropolitan areas, one hundred and ninety-four applications flooded in.

Cellular systems are presently being tried in Chicago and in Washington, D.C., each system comprised of a network of transmitters covering a thirteen to three hundred square mile cell. Computers switch calls from transmitter to transmitter as the user travels around the metropolitan area.

General Electric has filed a proposal with the FCC for a slightly different car radio system which would enable users to make and receive calls that will be relayed between the car and the public telephone network through a base station attached to the user's home or office telephone. The range

of the system would be three to five miles, but General Electric anticipates that other companies will begin building and operating retransmitters to relay the mobile unit signals which will enable the subscriber to make and receive calls within a fifteen mile radius of the base station [Ref. 39]. Such systems could greatly improve response time of senior decision makers when out of their offices.

a. Teleconferencing

The rapid escalation of energy costs in the past decade, combined with two recessions within the past five years, have spawned a rapidly growing market in teleconferencing. Preliminary studies have shown that teleconferencing offers both financial and decision-making advantages.

Teleconferencing comes in various options from what is little more than an amplified telephone call between two users to large video conventions.

(1) Audio Conferencing uses a voice transmission unit or audio box to connect two or more telephones between two offices with a number of people present at each location.

(2) Multi-point Audio Teleconferencing links more than two locations through a centrally located piece of equipment, thereby enabling attendees at several geographical locations to hear and to be heard.

(3) Audio-plus-graphics Teleconferencing is accomplished through the use of facsimile equipment, telewriting equipment, and/or an electronic blackboard--a

recent innovation which allows an image, written or drawn with regular chalk on the blackboard to be digitized and transmitted to the other conference locations where it is displayed on cathode ray tubes (CRT's).

(4) There are two types of Video Teleconferencing: continuous-motion, or live, video; and slow-scan, or freeze-frame, video. With Continuous-motion video, the picture changes thirty-three times per second, thus creating the impression that the picture is moving. With Slow-scan Video, the image changes only once every few seconds--ten to sixty-plus, depending on the bandwidth of the circuit--thus creating a slide show effect which is perfectly acceptable when there is little motion.

(5) Computer Conferencing is another form of teleconferencing in which a number of individuals use keyboard terminals, printers and telephone lines to access a common computer in order to communicate with one another. Participants can comment, ask questions, and dispute or seek further information on any of the material loaded in the computer or its files prior to the conference.

American Telephone offers two slightly different approaches to teleconferencing:

(1) AT&T Conference Operators are specially trained people who know how to set up a conference using the least expensive

routes. A uniform charge applies to setting up each leg or connection, and when the network is complete, the conference begins at normal long-distance rates to the points involved. The number of participants may be limited, however.

(2) AT&T PicturePhone Service is available in certain cities at specially-equipped rooms where tape recorders and TV monitors are also available. Costs vary with distance and length. AT&T opened its first teleconferencing centers (PicturePhone Meeting Service) in New York City and Washington, D.C., in the summer of 1982. At that time, the Company planned to have eleven more public studios operating within six months, and a total of more than forty by the end of 1983 [Ref. 38].

Darome Corporation has developed special equipment to permit large teleconferences. Participants join by dialing an area code and number, and may leave the conference at any time. Charges to set up the conference are by the hour, and during the conference regular long distance rates apply. Special voice-activation equipment prevents more than one person from speaking at a time, and a second phone line can be used to provide slow-scan video.

Teleconferencing rooms provide for audio and video contact, augmented by a variety of text, data, and graphics displays. Some rooms have large, six foot by nine foot screens. Participants have portable microphones to allow them to move around the room to use the electronic blackboards and/or other special equipment The camera is

triggered, focused, and directed by signals from the microphones. Smart copiers can transmit and receive not only hard copies of material brought by the participants, but also information which is in central storage. Such services are not inexpensive. A one hour session between New York and San Francisco is twenty-three hundred dollars. Users can install their own facilities for about two hundred and thirty thousand dollars, plus a monthly rental fee of nearly twelve thousand dollars. These costs must be compared to the alternative of cross-country travel expenses, and are expected to decrease when the services become more widely used.

According to Quantum Science, a New York-based research firm, the number of installed teleconference rooms will increase to 4340 by 1986, up from the 1981 figure of 575. Of those, 1165 will be continuous-motion video centers, 1425 will be slow-scan, and 1750 will be audio/graphics [Ref. 43: p. 70].

E. MONITORING COSTS

1. Cost Saving Options

Budgetary controls are a critical part of contemparary management techniques. One area of expense which can easily increase dramatically and put strains on the rest of the budget is telecommunications costs. It is hard to argue against the value and importance of telecommunications for speed, flexibility, and relative cost of information transfer in contrast with letters sent through conventional channels, or face to face communications which may necessitate time-consuming and expensive travel. Furthermore, the telecommunications industry has developed equipment and services which can serve to control and/or reduce telecommunications expenses, and also reduce the expenses of record

correspondence and face to face communications as well. For example, Phonetele Corporation makes a device called Phonemaster which restricts the locations to which calls can be made from a particular phone.

Another option is one of the call monitoring systems which are now available in several varieties. There is such a demand for this service that products are available from both large and small manufacturers. The least expensive devices are printers that act simultaneously with the dialing of a call. However, the chronological listing created must be processed to divide the calls into needed categories--such as originating station number, department number, or client number--raising the effective cost of the device.

A Rochester, N.Y., manufacturer, Sykes Datatronics, has developed equipment utilizing floppy disks, which provides complete management reporting. For outright sale, it is priced at less than seventeen thousand dollars ($17,000). This Comm-Stor unit is also tariffed by most Bell System companies, and is thus available on a monthly rental. Sykes also manufactures the Call-Quest unit distributed by a Sarasota, Fla., firm, Com-Dev. There are many other vendors of similar equipment in this approximate price range.

The most sophisticated equipment is built by firms like Datapoint of San Antonio (Infoswitch), ACTION/Honeywell of Dallas (Roadrunner and WATS-Box II), and Commander Systems Inc. of Worthington, Ohio (WATS Commander). The Infoswitch and the ACTION products offer least-cost routing advantages, plus many highly sophisticated features for better call management. Automatic least-cost routing can include limits on the number of calls waiting in the queue on any given line, and/or hold some lines open for priority communications. These accounting systems can also provide minute-by-minute records of calls by originating stations.

TDX Systems of Vienna, Va., offers a somewhat different system, which puts a special interface in the users long distance lines conveying dialing impulses to TDX's computer in Virginia. Needed data is recorded for producing management reports, and the call is placed over the least expensive route to destination. The user continues to pay for WATS or other low cost lines available for the organization's exclusive use. The TDX system eliminates the need to acquire hardware involved in the more expensive cost-control units.

2. Static Message Detail Recording

Telephone message accounting, also known as Static Message Detail Recording (SMDR), is another very important cost saving option. A less expensive form of call monitoring, SMDR is the automatic accumulation of telephone activity detail and its subsequent analysis. The details include elements such as the originating station number, the time and date of the call, the dialed digits, and the duration of the call. From this information, call costs can be determined, analysed, and assigned to specific departments--a GSA requirement [Ref. 40: p. 92].

Rotelcom Inc., a subsidiary of Rochester Telephone Corp., has developed an efficient, inexpensive call record system--the Management Information Telephone Tracking System (MITTS)--to capture and report call data in order to facilitate attribution of calls to the appropriate department in an organization, and to reduce abuses of the phone system. This system works with any PBX model with data recording capability, or a data collection device can be added to PBX's lacking this capability.

MITTS collects, stores, processes, and reports call data; warns of trunk defects or inactivity; and spots problems, abuses and waste. It allows managers to attribute

calls to the proper location and department, to identify to whom calls went, and to have charges itemized. Heavy users can be identified, and corrective action can be initiated if the report reveals that there are less expensive alternatives which could be used. This system can be used to analyse whether telephone capabilities are being used efficiently, to ascertain how many calls are being placed over toll facilities that should be placed over a lower cost-line, or to determine what is the maximum number of calls placed in a given hour on a given day. Such information can be used in decisions to increase or to decrease telephone services.

When a call is placed, the data and time, the extension from which the call was made, the number dialed, the trunk the call went out on, and the duration of the call are captured on a cartridge or on a floppy diskette. Once or twice a month, the cartridge or diskette is shipped to Rotelcom. Within forty-eight hours of receipt, each customer's data is processed and a series of management reports is produced. Various basic and optional standard reports are available, reports tailored to the individual user can be generated, and historical profiles can be prepared which can be useful in forecasting future equipment and service needs [Ref. 41].

Telecommunications experts offer a note of caution: many users of long distance accounting equipment have had numerous operational and service problems, and a prudent manager will be certain that the vendor has been in business long enough to establish a track record for equipment quality and service--and check user references carefully [Ref. 42].

3. Teleconferencing Savings

Holiday Inns has introduced its Hi-Net Television Network between its motels using the same satellite transmission system which it uses for guest room movies. In 1980, a teleconference for four hundred and fifty (450) people in thirty (30) Holiday Inns located near the participants' homes cost eighty-five thousand dollars ($85,000) as compared to a five hundred and fifty-five thousand dollar ($550,000) similar-size live conference, including costs of travel and overnight accommodations [Ref. 42: p. 58]. In the past year, Hilton Hotels Corp., Sheraton Corp., Marriott Corp., Hyatt Corp., and others have also introduced video conferencing systems.

Dr. Kathleen J. Hansell, marketing programs representative at Satellite Business Systems (SBS) of McLean, Virginia, conducted a survey of ten large corporations--all experienced users of video teleconferencing-- to determine how effective this technique had been in affecting company performance. According to Dr. Hansell, the results were as follows:

(1) Three-fourths of the respondents reported an increase in personal productivity resulting from video conferencing;

(2) One-half noted increased meeting effectiveness;

(3) One-half reported a decrease in the time spent making decisions;

(4) One-third saw an increase in the quality of decision making;

(5) Three-fourths reported a decrease in travel-expenses;

(6) Three-fourths reported a decrease in time spent away from the office; and

(7) One-half of the respondents felt that the amount of communications among the various parts of the organization increased.

According to Dr. Hansell, ninety percent of the users were satisfied with the overall use of video conferencing [Ref. 43: p. 69].

Although the above data is obviously biased, the cost of teleconferencing is expected to decrease as the practice become more widespread, and the military base telecommunications manager may find that teleconferencing can increase efficiency and save the base a substantial amount of travel money, while eliminating long, unproductive periods of travel for decision makers. In an experimental computer conference conducted by the U.S. Army it was discovered that the kinds of decisions that usually took one or two weeks to be reached were made in one or two days using a computer-conference [Ref. 43: p. 68].

4. The Bell System

A monolithic defender-style company such as AT&T which has actually had disincentives towards innovation and cost saving would be expected to be somewhat reluctant to enter the fray. The divestiture of the BOC's may even have a negative effect on the pure research oriented Bell Laboratories by redirecting the Lab's effortsto applied R&D [Ref. 44].

American Telephone and Telegraph's competitors have been building computer microprocessors into business telephone products for years, and the other equipment suppliers have been faster than Western Electric in introducing computerized features into home telephones.

However, the new American Bell Incorporated products are beginning to offer some unique features. For the business world, ABI will soon be marketing the previously

mentioned Genesis Telesystem, designed to accept optional software cartridges which provide features such as a private seventy-five name personalized telephone directory, or an electronic padlock that controls who uses the phone and what type of calls can be made.

F. ACQUISITION STRATEGY

The above shopping list of new telecommunications equipment and services should provide the military base commander and base telecommunications manager some understanding of the range of options available, and should stimulate ideas of how these new options can increase the efficiency of the base personnel. But it also should serve to demonstrate the increasing complexity in the selection process. Some of the choices will be easily made, while others will require careful, detailed planning. This paper will now present an example of an acquisition strategy which may be used in planning for large acquisitions, but will also be useful as an intellectual discipline in decision making for small purchases.

VIII. DEVELOPING A TELECOMMUNICATIONS ACQUISITION STRATEGY

A. NO JOB TOO LARGE OR TOO SMALL

Whether managing the acquisition of systems to serve the telecommunications needs for a large metropolitan area encompassing several stations or posts within a base or fort, or providing telephone circuits for an isolated outpost, the rapidly evolving nature of the world of telecommunications makes it imperative that the military base telecommunications manager have a good grasp of what capabilities he or she has, what capabilities he or she could be providing to improve the efficiency of the base, and how to resolve any deficiencies. Sound management strategies and techniques will greatly simplify the job.

B. AN ILLUSTRATION

Last year a study was undertaken by the Washington Telecommunications Interagency Committee (WTIC) to assess the government telecommunications needs in the Washington, D.C. metropolitan area. The study called for a system capable of providing a combination of services--from automated cost and system management to integrated office automation to transmission of voice and data to teleconferencing and sensor services to security and protection arrangements and optional video [Ref. 45].

The type of network recommended in the study consists of switches in a fully integrated system able to accommodate most of the government's exclusive use requirements. Such a switch would improve on traditional switches or private branch exchanges so extensively that it would be given a completely new designation, controller, because this better

describes the computerized controls with their associated processor capabilities.

The Committee proposed that economic value should be based on at least a ten-year life cycle using present value costing, but that least cost should not be the sole determining factor. Agency operational needs also must be stressed.

The Committee could not decide whether installation and maintenance services should be provided by the government, by the supplier, or by independent contractor; but to provide greater economies, the Committee recommended that the Department of Defense telecommunications servicing agencies in the area should interface with the core system, since the DOD represents such a large segment of the telecommunications users in the Washington area.

C. PROCUREMENT STRATEGY

While the magnitude of the above cited system (if implemented, this telecommunications system would be the fifth largest in the United States) is beyond the requirements of the typical military base, and beyond the scope of responsibility of the typical military base telecommunications manager, many of the problems and issues faced are similar; and, whether the acquisition is a major system or a simple PBX, the development of a workable telecommunications acquisition strategy will inevitably assist the military base telecommunications manager with the procurement.

The first, basic, and most essential issue to be addressed in any telecommunications acquisition, is the question of how the telecommunication system will contribute to the more efficient running of the base. This question must be paramount in any acquisitiion decision, and each of the steps in the procurement strategy must be oriented to the efficient, cost-effective administration of the base.

With this in mind, the development of a procurement strategy can be approached in five steps:

(1) Define the procurement objective,
(2) Consider the ways to achieve this objective,
(3) Develop the operational specifications,
(4) Derive the functional specifications,
(5) Do a cost/benefit analysis.

Steps two through five are interrelated and feedback upon each other, because economic analysis is a major factor in determining the way in which to achieve the procurement objective, but not the only factor.[21]

1. Defining The Procurement Objective

The procurement objective defines the strategy to be employed in undertaking the acquisition of a particular telecommunications system. The objective which the military base telecommunications manager will choose should be an expression of how telecommunications can enhance the accomplishment of the administrative requirements of the base. The procurement objective addresses the questions of:

(1) What is to be accomplished,
(2) How much is to be done, and
(3) When it must be accomplished by.

This includes both quantifying the costs and qualifying the benefits, which may, in turn, lead to a quantitative modification of the objective.

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[21] Because economic analysis is crucial to a complete procurement strategy, and because it tends to be the most difficult and time consuming part of the process, it will be treated at length.

2. Considering The Ways To Achieve The Objective

The next step is to list all possible ways of achieving the procurement objective and all the constraints: political, social, economic, etc. Then work through the options, beginning with the one which appears to be the best and going down the entire list. This may point out potential problems which had not been apparent, such as the effect of introducing a new system on the workings of the organization, implementation conflicts, etc. The results of the procedure should be formalized in a written document.

3. Developing Operational Specifications

Once the objective and the preferred means for obtaining it have been solidified, the next step is to prepare the operational specifications, a quasi-picture of the future system which shows what the system will do. These specifications will include the physical requirements, determination of who will administer the system, how the system will be maintained, how security needs will be met, and how performance will be monitored. It will also include implementation plans and strategies to cover areas such as preparation and training of the future users, tests for acceptance of the new system, plans for orderly transition to the new system, and procedures which will be used to handle the system expenses.

Additional issues to be addressed in the operational specifications include: the useful life of the present system/equipment; its residual value; and an estimate of the cost savings/increases which would come about if the recommendations were implemented.

4. Deriving The Functional Specifications

By this time, the operational requirements and specifications for the new system should be nearly complete, giving a complete, consistent and irreducible definition of the system to be acquired. It should set forth explicitely everything which is required of the system and only these requirements. From these operational requirements, the government or vendor systems designers can begin to develop the functional specifications which describe functional performance required of the system--such as system availability and integrity, usage data during normal and peak times and the duration of these times--and functional constraints--such as cost, availability of funding, data required, physical location, power availability, maintenance availability, etc. It should include full specifications for the acceptance tests, specifics on how the system will be implemented and how it can be enhanced and/or expanded, and vendor requirements such as procedures for training users, what the supplier's maintenance responsibilities will be, documentation, etc. In developing the functional specifications, the system designers will need to continually refer to the operatinal specifications in order to ensure feasibility and to search for inconsistencies. The more accurate the operational specifications, the more accurate will be the functional specifications.

5. Economic Analysis

Inextricably connected with the decision of the way in which to achieve the procurement objective is a cost/benefit, economic analysis of the options available. The procedure is iterative and step five feeds back to steps two through four and steps two through four feed back to step five in such a way that economic analysis becomes a major tool in the decision of which system, if any, to procure.

Economic analysis of acquisition of new telecommunications equipment and/or systems can, of itself, prove to be a very worthwhile exercise for the military base telecommunications manager to both aid him or her in selecting the best means to satisfy his or her goals, and to provide a clear presentation of alternatives when assistance from outside agencies is required in order to obtain funding; or to enable him or her to assist superiors in their decision making. Realizing that there are many and varied ways in which the base telecommunications system can significantly affect the satisfactory accomplishment of the administrative load of the base, the base telecommunications manager should undertake determination of the costs and benefits of each possible course of action, and tailor his or her system for the optimum efficiency for the least cost.[22]

a. Strategies

Although the goal of any economic analysis may be to obtain maximum benefits for minimal cost, this is not always attainable. Therefore, before the military base telecommunications manager begins the economic analysis, he or she should decide which of the following strategies will direct the proposed acquisition:

(1) Maximize benefits for a given cost;

(2) Obtain a given performance objective at minimum cost.

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[22] The process is always simpler to describe than it is to execute, and a case could be made to prove that economic analysis is more an art than a science. But the process can also prove to be informative and rewarding, and reference manuals are available to assist in the process. One such reference is the Department of Defense Economic Analysis Handbook, published by the Defense Economic Analysis Council [Ref. 46]. The bulk of the material to follow comes from this source.

b. Steps In The Economic Analysis Process

The process of economic analysis of acquisition of telecommunications equipment and/or services can be broken down into five distinct steps:

(1) Specify objectives and assumptions;
(2) Devise appropriate alternative courses of action;
(3) Determine the benefits or effectiveness of each alternative;
(4) Cost out these alternatives;
(5) Summarize, evaluate, and present the cost/benefit determination for the alternatives.

The definition of the problem is the first and perhaps most difficult, but also the most important step in the process.

(1) Specifying Objectives And Assumptions. The objectives should be expressed as some fixed standard of accomplishment--for example, to provide the base officers access to the base commander or his deputy at any time, day or night, within five minutes, with a ninety-five percent probability of success, and within thirty minutes, with a ninety-nine percent probability; or to make WATS lines servicing six commands or tenant commands continuously available ninety-eight percent of the time. In formulating a statement of objectives, the telecommunications manager should consider the basic activity of the base in quantifiable terms such as requisitions processed, training hours, flight hours, etc. He or she should also consider the organizational product: personnel trained, exercises run, machinery repaired, etc. Next to be considered are extra-organizational values such as quality of personnel trained, reliability of ship repairs, etc. Finally, social values such as ability to contribute to the alleviation of human

suffering during natural or man-made disasters should be considered. From a clear notion of the procurement objective, the telecommunications manager can begin to consider what contribution changes in the telecommunications system can make towards accomplishing the objective and the various methods and products involved in this accomplishment.

(2) Devising Appropriate Alternative Courses Of Action. Once the objectives have been established, the telecommunications manager can begin to consider the alternatives which are available, or could be developed to aid in achieving this objective. During this search phase, he or she must endeavor to avoid too many specifics, yet must be personnally very knowledgeable in the options available in the telecommunications industry. Knowledge of the previous history and structure of the telecommunications industry and of the most recent developments in deregulation, and a working knowledge of many of the most common equipments and services currently available, will greatly assist the military base telecommunications manager during this search phase of the economic analysis process.

The telecommunications manager will want to explore all feasible ways of meeting the objective defined in step one. This will necessitate close interaction between him or her and the people who are tasked with the administration of the base, and with the person or persons who will be making the decisions about whether or not to acquire the proposed system or equipment. It also will require interaction with the telecommunications industry, and, depending on the magnitude and/or complexity of the system involved, may also require employment of consultants. Should consultants be required, the consultants must be given a clear understanding of what the telecommunications manager wants to accomplish--the procurement objective--and the military base telecommunications manager must be able to

converse knowledgeably with the telecommunications industry experts.

To support and to reasonably limit the process of economic analysis, it is mandatory to formulate all the assumptions which underlie the study. If the assumptions are valid, there should be some means of documenting their validity. Certain assumptions should be considered as mandatory, for example, the assumption of the economic life of the equipment or project--is it limited in technological life, or is the future of the base limited by military or political considerations. Also required is the assumption of the period of comparison for different alternatives and/or benefit yield dates--dates by which the required services or equipment must be in place and operational. Some alternatives may be less expensive and more beneficial than others, but may not become feasible until after the benefit yield date which renders them unacceptable because they do not provide results soon enough to be utilized. Some alternatives may be better in the short run or in the long run than are the other choices, and should be evaluated as such.

(3) Determining The Benefits Of Each Alternative. During this phase of the process, some of the previous assumptions will have to be brought into play as the telecommunications manager attempts to give quantifiable values to the benefits which can be accrued by acquisition of each of the different alternatives available. In this endeavor, he or she may well want to seek out assistance from a cost analyst in the Comptroller's office.

Determining the value or benefit of an alternative is a four-step operation:

(1) List and define the relevant benefits;
(2) Establish sources of information for benefit determination;

(3) Collect and display information for benefit determination; and

(4) Summarize, evaluate, and present the benefit determinations for the alternatives.

To determine the relevant benefits, list all the benefits which may shed light on the economic analysis of alternatives, then define each benefit in relation to its respective alternatives. At this stage the telecommunications manager will have just a description of each benefit, not a value judgement. Each benefit listed must be clearly and concisely identifiable and distinguishable from all the other benefits, must be directly or indirectly measurable using valid techniques of analysis, and must be related to the objectives which the economic analysis is attempting to facilitate. Some catagories into which benefits could be divided are: production, productivity, operating efficiency, reliability, accuracy, maintainability/controllability, manageability, availability, service life, quality, acceptability, ecology, economic, morale, safety, and security.

After the relevant benefits have been decided upon, they should be divided into two lists:

(1) Benefits where back-up information is available--tell where the information is and how to get it; and

(2) Benefits where back-up information is not available--tell the proposed method for obtaining the information.

Collection of the information needed for determination of benefits will require cooperation between specialists in the field and individuals knowledgeable in the disciplines concerned. On a small scale this will be the military base telecommunications manager and the cost analyst from the Comptroller's office, and on a large scale

this will involve experts in acquisition techniques at a higher eschelon who will be attempting to identify the best means by which to achieve the objective established by the telecommunications manager.

(4) Costing Out Alternatives. Establishing costs may be as simple as consulting tariffs, or competitive rate schedules; or it may be as complex as parametric cost estimating. In some cases the estimators may have a great deal of experience and knowledge in the area which will allow them to estimate costs of individual components in the system and to sum these costs up to get a good estimate of the cost of the system. This is known as the industrial engineering method of cost estimation. Parametric cost estimating assigns an estimated cost to the various parameters of the system. This method requires historical data from previous projects which may not be available, or may be difficult to determine. If sufficient data is available, regression analysis may be applied in order to smooth out the data and obtain representative costs.

If parametric cost estimating is used, several pitfalls must be avoided. The user must be aware of the source of the estimate and the purpose for which it is intended, and must not attempt to apply the estimate beyond its natural limits. Equations which may adequately describe one system may not be predictive of another system. Consistency of detail is essential--e.g. dollar figures must be adjusted for constant year dollars, and measurements must be in like units.[23]

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[23] Nominal dollars are dollar measurements that are not restated for fluctuations in the general purchasing power of the monetary unit, whereas constant dollars are nominal dollars restated in terms of equivalent or constant purchasing power.

A third analytic method is the analogy method---simply a judgment based on knowledge of similar products or similar concepts. Experiences at other military bases may be quite useful for this method of analysis.

Procurement financing alternatives should also be weighed: short-term rental; straight lease; lease with negotiated payment drag; full payout lease; lease with right to purchase as the end of term; etc. In the fast-changing world of telecommunications, short-term contracts which do not tie the user to a specific technology for a long period of time may be a distinct advantage.

Intrinsic cost savings which might become available should also be included: personnel reduction; removal/reduction of on-call maintenance payments due to purchase of more reliable equipment; etc.

The telecommunications manager must evaluate all the purchase/lease alternatives in addressing his or her decision, or for presenting superiors not only appropriate decision criteria, but sound recommendations as well.

During the process of determining costs and benefits is a good time to review what has gone on so far, and to add or delete items from the list of relevant benefits.

(5) Evaluating Alternatives. Many techniques are available for summarization, evaluation, and presentation of the costs and benefits: graphic analysis, regression analysis, indexing, decision theory, marginal analysis, ratios, linear programming, mathematical and economic statistical modeling, polling--such as the Delphi method--etc. Displays should be arranged in order of significance, and, if possible, benefits should be combined to give a composite score for each alternative in order to reduce some of the detail. Another device which may be useful is to convert actual output to some common factor

such as dollars. Table II shows samples of benefit determination displays.

If costs and benefits can be measured on continuous scales--dollars per year, availability per time period, etc.--graphic displays may greatly facilitate the presentation of data. It may be useful to select either a fixed cost or a fixed benefit schedule and determine how the alternatives will vary over time. If the presentation is in terms of nominal dollars (not discounted to include the factor of inflation), the presentation may have to be repeated using constant (current year) dollars also. Depending on initial strategy, the alternatives may be ranked according to:

(1) Least cost for a given level of effectiveness;

(2) Most effectiveness for a given cost constraint;

(3) Largest ratio of effectiveness to cost.

The graphic format method of presentation for decision making permits ranking over a range of time, and it allows the decision maker to see at a glance all the information which might be lost in a tabular maze. Figure 8.1 shows the entire process of comparing alternatives using graphic analysis. Figure 8.2 shows four methods of comparing costs and benefits where one alternative is clearly dominant. Alternative A3 dominates all the others (has lower total costs for any level of benefit), regardless of the dollar base chosen. The decision is clear-cut and is constrained only by the budget limitations. Figure 8.3 adds the factor of budget limitation. If the budget is expected to be at the level BH, then levels EH1, EH2, and Eh3 of effectivesness can be achieved with alternatives A1, A2, and A3, respectively. The alternative which has the greatest benefit for the expected budget constraints ranks highest.

The situation is further complicated when the factor of uncertainty about the data is added to the analysis. Figure 8.4 shows the situation when there is no strict dominance and a wide range of uncertaintity in evaluating costs and benefits.

If complete dominance of one alternative over the others does not occur, or if it occurs for constant dollars but not for discounted dollars, then further analysis of benefits over time is necessary. Figure 8.5 shows benefits graphed against time for three cases: dominance over time, no dominance over time, and uncertainty and no dominanace over time. If an assumption of economic life has been made, then the decision maker can select the alternative which mazimizes benefits over the economic life span.[24]

D. CONCLUSION

For some of the procurements undertaken for the base by the base telecommunications manager, many of the above procedures may be merely implicit or even unnecessary. For others, the complexity of the analysis will require the assistance of consultants from within or from outside the government. But in all cases, going through the complete analysis--and particularly the cost/benefit economic analysis--will help reduce the chances of making inappropriate choices, and will increase the chances of selecting the best of the feasible alternatives. If the military base telecommunications manager is not the decision maker, but rather performing a staff function for his or her superior,

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[24] Although much more complex situations can be presented, this paper is not intended to be an exhaustive treatise on economic analysis. For more details, see reference 46. For a guide for critiquing economic analysis, (modified from reference 46), see Appendix B.

the evidence of a complete, thorough analysis and the clear, concise cost/benefit displays will greatly facilitate the decision-making process.

TABLE II

Samples Of Benefit Determination Displays

Benefits (In order (of significance)	Mode of Appraisal or Measurement	Alternatives (All years)	
		I	II
A. Quantifiable Benefits			
1. Productivity	# of line items per manhour	100	50
2. Accuracy in operation	Stockpicker errors per 1000 line items issued	12	6
3. Customer Satisfaction	% shipped on time	70%	90%
4. Safety	Employee accidents per year	3	1
(Composite Score If Possible)			
B. Nonquantifiable Benefits			
1. Morale	Concensus of employee opinions	Climbing ladders is not desirable; wastes energy	Desirable Material easire to reach, less tiring

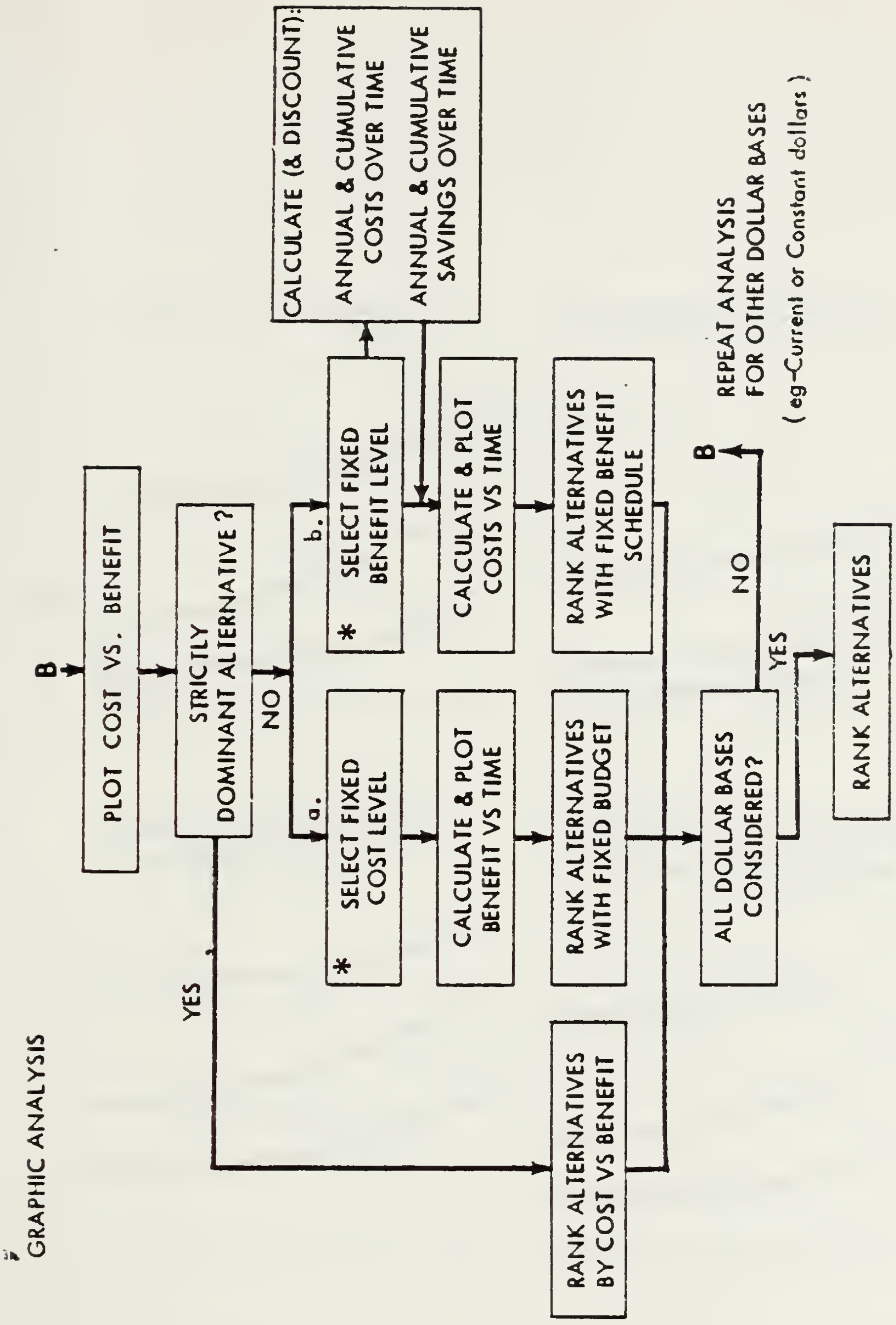
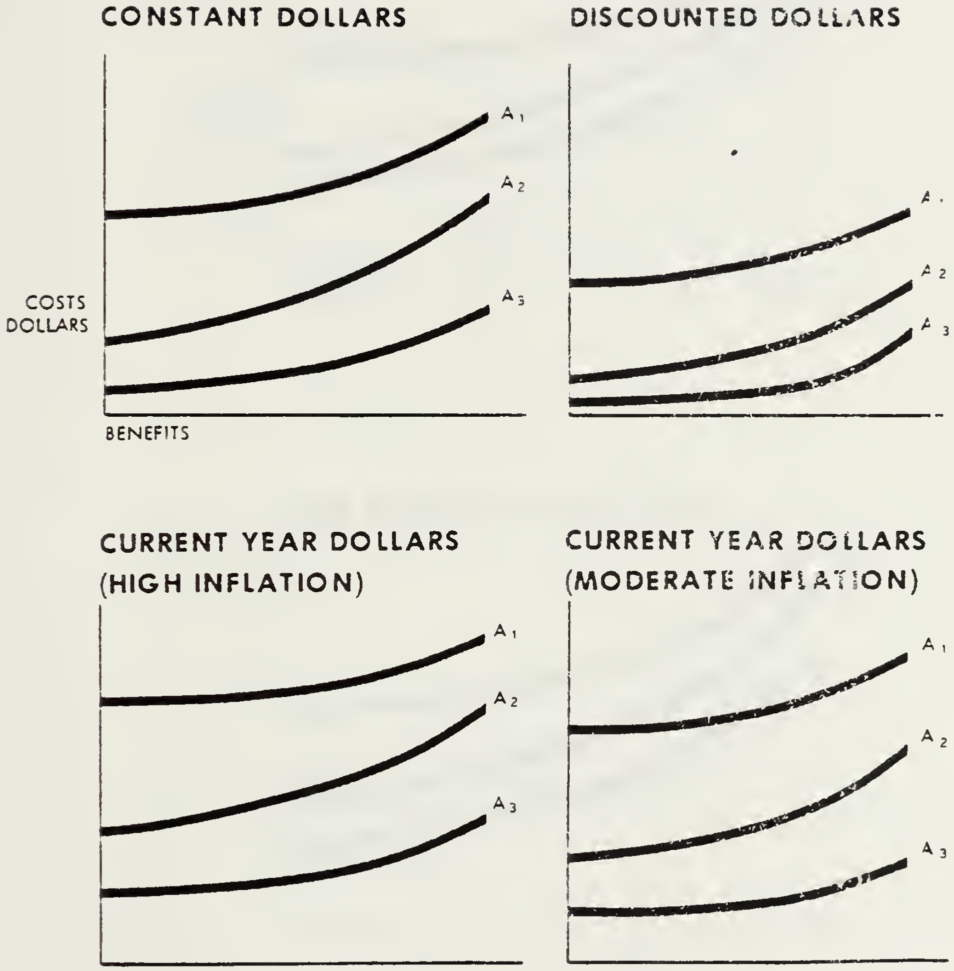

B
PLOT COST VS. BENEFIT
STRICTLY DOMINANT ALTERNATIVE ?
NO
YES
a.
* SELECT FIXED COST LEVEL
b.
* SELECT FIXED BENEFIT LEVEL
CALCULATE (& DISCOUNT):
ANNUAL & CUMULATIVE COSTS OVER TIME
ANNUAL & CUMULATIVE SAVINGS OVER TIME
CALCULATE & PLOT BENEFIT VS TIME
CALCULATE & PLOT COSTS VS TIME
RANK ALTERNATIVES WITH FIXED BUDGET
RANK ALTERNATIVES WITH FIXED BENEFIT SCHEDULE
RANK ALTERNATIVES BY COST VS BENEFIT
ALL DOLLAR BASES CONSIDERED?
NO
B
REPEAT ANALYSIS FOR OTHER DOLLAR BASES (eg-Current or Constant dollars)
YES
RANK ALTERNATIVES
* GRAPHIC ANALYSIS

Figure 8.1 The Process of Comparing Alternatives.



CONSTANT DOLLARS

DISCOUNTED DOLLARS

CURRENT YEAR DOLLARS (HIGH INFLATION)

CURRENT YEAR DOLLARS (MODERATE INFLATION)

Figure 8.2 Cost vs Benefits.

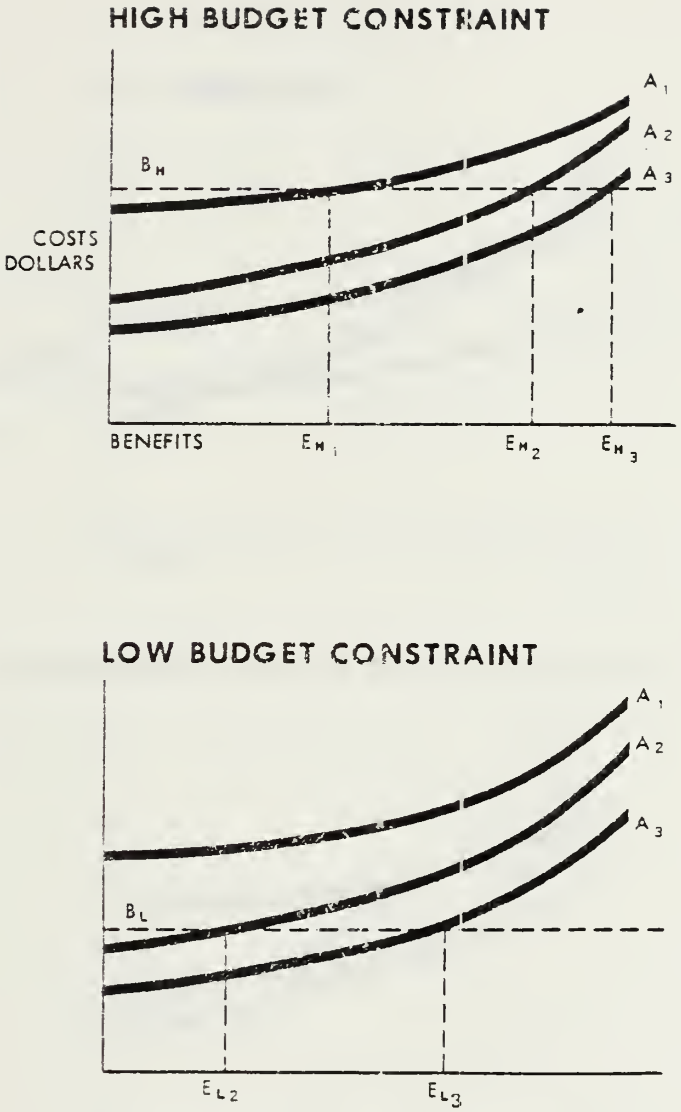


Figure 8.3 Cost Benefits With Dominance and Constraints.

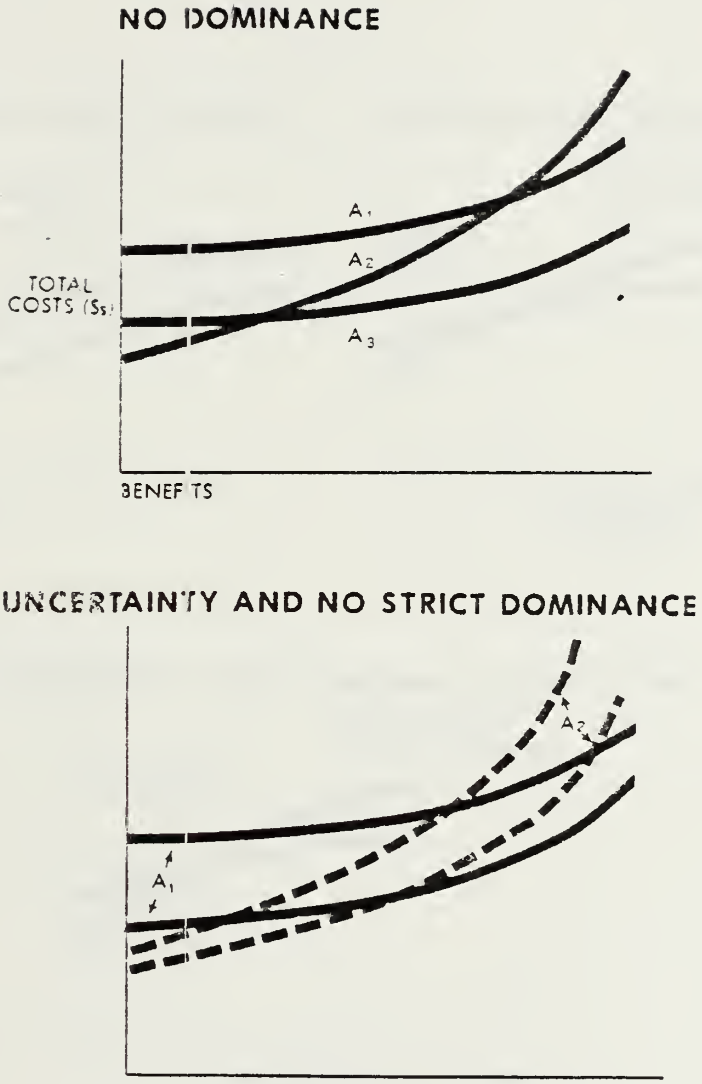


Figure 8.4 Cost/Benefit: No Dominance, Uncertainty

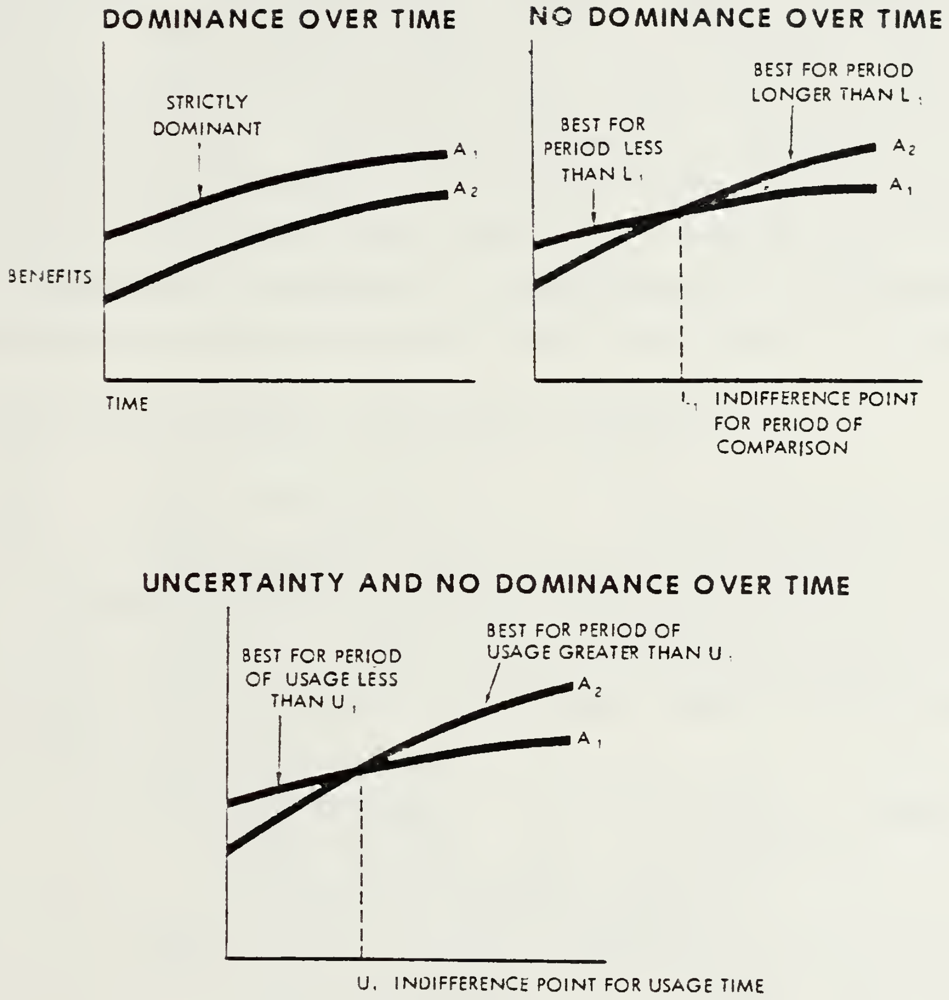


Figure 8.5 Benefits vs Time At Fixed Budget Level.

IX. MANAGEMENT STRATEGIES

Presuming that the military base telephone system is already in place, or that new equipment or services are being installed, the next phase of management development for the military base telecommunications manager is to establish an efficient and effective day-to-day management strategy. The emphasis should be on utilizing the types of sound approachs to management which will serve to facilitate smooth operations, yet will be flexible enough to be useful in crisis or emergency situations. Like sound acquisition strategies, good day-to-day management strategies begin with the objective of enhanced administrative efficiency and cost-effective communications, and flow from this objective.

A. TELECOMMUNICATION MANAGEMENT OBJECTIVES

With a clear understanding of the purpose for which the base telecommunications system has been established, the base telecommunications manager can develop a set of management objectives with which he or she can approach day to day decisions. The following is a sample list of telecommunications system objectives:

(1) Understanding the structure, application, capabilities and limitations of the installed telephone system;

(2) Knowing where communications dollars are going and whether or not the services being provided are sufficient and satisfactory;

(3) Planning and implementing services which support the organization's work systems;

(4) Attempting to reduce or at least control communications costs through avenues of cost avoidance and cost reduction;

(5) Promoting cost awareness at all organizational levels;and

(6) Anticipating future needs and planning to meet them.

E. DAY-TO-DAY MANAGEMENT

Over and above the information gathered during the procurement of hardware, services, and maintenance, the base telecommunications manager must have access to complete documentation for the equipment and services which comprise the base telecommunications system. Documentation that the telecommunications manager should have (where applicable) includes:

(1) Circuit layout records,

(2) Network maps,

(3) A hardware and software cross-reference guide,

(4) All network vendor maintenance records,

(5) Software listings by network task and component,

(6) All user-site telephone numbers and individual contacts,

(7) An interface/component, maintenance history log located at each user or nodal site,

(8) Circuit-control telephone contact index and log,

(9) A total system maintenance history,

(10) Inventory by serial number of all network components by site,

(11) Network redundancy locations and switching criteria, and

(12) Vendor contractual or tariff commitments.

In addition to documentation, the military base telecommunications manager must try to make the system user friendly by establishing clear, easily followed procedures for the telecommunications system, and promulgating these operating procedures to concerned personnel in an effective manner. Examples of operating procedures which must be carefully formulated are:

(1) Operating manuals by network component,

(2) Comprehensive view of network operations,

(3) Trouble tickets,

(4) Preventative maintenance procedures,

(5) Fallback techniques,

(6) Escalation levels,

(7) Diagnostic techniques by component or type of trouble,

(8) Standards of performance quality by component, and

(9) Disaster protection or recovery manual.

C. MAINTENANCE

1. Responsibilities

In the past there was no economic advantage to a user in self-maintenance of telephone equipment and wiring because the cost of maintenance was built into the general tariff rates. As a result of Computer Inquiry II, this will soon no longer be the case. As the industry's customers participate increasingly in management of their own telecommunications systems, they will need to develop their own strategies for dealing with the systems' maintenance. One strategy that large organizations are adopting is to set up

what amounts to their own communications company. Although Federal Express Incorporated was not unhappy with AT&T services, it is convinced that you can get better service less expensively by doing it yourself. "If you control your own network, you have more incentive to improve its reliability," says James L. Barksdale, Senior Vice-president [Ref. 2: p. 66.].

2. Maintaining Reliability

The relevance of the issue of reliable end-to-end service was reaffirmed in a December, 1981, government report on the outage data on two categories of the National Communications System Priority One Circuits--circuits intended to provide service to the most critical users in the national security community. [Ref. 47: p. 23.]. That analysis, covering the period of February 1 through June 30, 1981, determined that a total of three hundred and two (302) discrete outage incidents were reported to the DCA/DCS Operations Center affecting ninety-eight (98) separate Priority One circuits of the eleven hundred and seventy-nine (1179) such circuits provided in the continental United States exclusively by the Bell System. For the three hundred and eighty-seven (387) Priority One circuits provided in CONUS by a combination of Bell System and other carriers, the analysis found that one hundred and eighteen (118) separate circuits had been reported as having experienced outages, with five hundred and sixteen (516) discrete outage incidents. The analysis thus indicated that eight point three percent (8.3%) of the exclusively Bell System-provided Priority One circuits experienced outages during the measurement interval, while almost thirty-one percent (31%) of the combination Bell System-other-carrier-provided Priority One circuits experienced outages. Furthermore, the total outage time for

exclusively Bell System-provided Priority One circuits was thirteen hundred and twenty-six hours (1326), which equated to down-time of three point one percent (3.1%), and a total resource availability of ninety-six point nine percent (96.9%); while for the combination of Bell System-other-carrier-circuits, the total outage time was fourteen hundred and fifty hours (1450) or a down-time of twelve point three percent (12.3%) with a total resource availability of eighty-seven point seven percent (87.7%).

The Bell System has historically striven for extremely high transmission quality and call completion probability. Its competitors view these quality standards as excessively high and have engineered their products and services to lower traffic performance criteria [Ref. 16: p. 162]. The competitors' success in the marketplace seems to indicate that the lower standards are acceptable to significant numbers of customers. Unless the customer is willing to pay a premium for higher performance, lower network performance may well become the norm for the Bell System as well since AT&T is forced to respond to competitive pressures.

Until the dramatic change in strategy by the Bell System in December of 1981 as a result of the pressures of the antitrust suit, Bell had had a vested interest in making quality a ploy for proving to the government the importance of maintaining the Bell System natural monopoly as a nation-wide telecommunications network; and judges in the antitrust suit brought by MCI Telecommunications Incorporated against AT&T (and confirmed by the appeals court even though the appeals court returned the suit to the lower court for further adjudication) have ruled that AT&T has violated antitrust laws by delaying, disrupting or providing inappropriate connections for MCI's long distance service [Ref. 48]. The clear implication is that AT&T was not

providing appropriate quality facilities to its long distance competitors. Whether this can be proven or not, there is every reason to believe that the recent changes in the telecommunications industry will lead to degradation in overall service and circuit and equipment maintenance, and the military base telecommunications manager will need to be keenly aware of the options available to him or her regarding maintenance of the base system.

Another cause for concern is the demise of the nearly-indestructable telephone instrument. All the previous incentives to build a long-lasting, cost-is-no-object instrument have been reversed, and the telecommunications manager will be forced to prepare a tight set of performance specifications for the equipment that he orders in order to ensure receiving adequate quality in the equipment purchased for the base.[25]

The FCC registration program offers the equipment purchaser some assistance in obtaining quality by requiring certain technical standards for interconnected telephone equipment, though the intent of this program is to prevent possible harm to the telephone network, not to guarantee equipment quality.

Services such as the Navy may find it cost effective to do their own maintenance on base instruments and wiring in a manner similar to that presently accomplished by the Army.

The alternative of electing to continue to have the local telephone company (BOC or Independent) maintain equipment and wiring procured from and installed by the company is viable, but would also require additional contracts with

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[25] One strategy recommended to consumers interested in purchasing non-telephone company instruments is to have a telephone company-supplied instrument as a backup in case the new instrument fails.

companies providing equipment not obtained from the local telephone company, and would do nothing to address the problems associated with long distance services. A third alternative is third-party maintenance in which--for a fixed fee--a contractor would manage the maintenance for all the various types of services and equipment associated with the particular military base.

X. SUMMARY AND CONCLUSION

A. SUMMARY

This thesis has presented an overview of the recent dramatic changes in the telecommunications industry in order to show how these changes will affect future military base administrative telephone and data communications. A short excursion into the history of the telecommunications industry has revealed that there has been a significant amount of interaction between the industry and the federal government, specifically a close alliance between the Department of Defense and the American Telephone and Telegraph Corporation, and a close regulatory relationship between the entire industry and the Federal Communications Commission since the birth of the Commission in 1934. Increases in competition in the telecommunications industry in the last twenty-five years have been dealt with in detail in order to discern the causes and the effects of these increases, and to determine what effects they will have on military base telephone communications facilities and capabilities.

Coinciding with the recent influx of competitors and products into the telecommunications industry have been two major events, the FCC Computer Inquiry II Decision, and the Consent Agreement between AT&T and the Department of Justice. These three currents have come together to form a tidal wave which is battering the structure of the industry and the way in which customers deal with the industry.

B. NEW TITLE: MILITARY BASE TELECOMMUNICATIONS MANAGER

Because these events and their effects simply cannot be ignored, the military base telephone officer or communications officer who is responsible for providing telecommunications services and equipment for his or her base will be forced to adopt a more active approach towards managing the base telecommunication system. Because of this necessary change in the job of the telephone/communications officer, this paper has redefined the title of the position to "military base telecommunications manager".

Several requisite facets of this new role have been presented in this paper:

(1) The need to understand what has been the nature of the telecommunications industry in the past;

(2) The need to understand what effects the the dramatic increase in competition will have on the industry;

(3) The need to be aware of the relationship between the telecommunications industry and the federal government;

(4) The need to know the contents of the FCC Computer Inquiry II Decision;

(5) The need to know the provisions of the Consent Agreement between AT&T and DOJ;

(6) The need to understand what effect all of the preceding events will have on the role of the telecommunications manager; and

(7) The need to be able to recognize what new opportunities are becoming available;

The simple environment of doing business with a public utility which handles all the details for providing all the services required to meet the customer's needs is gone forever. No longer can the telecommunications industry be

treated as one monolithic entity which provides the complete network and all the equipment to connect users to users, wherever they may be, just as the electric company provides power at the plug in the wall in such a manner that the multiplicity of sources and the interconnection of power grids is transparent to the user.

In order to best assist the base commander by providing a telecommunications system which will significantly enhance the administrative efficiency of the base personnel and will provide the best services for the least costs, the military base telecommunications manager must indeed be a manager, and must employ all the modern management techniques at his or her disposal. One approach to developing an effective acquisition strategy has been presented in some detail in order to give a practical example and in order to indicate some of the benefits which can accrue from using good management techniques.

C. MANAGEMENT ISSUES

Day-by-day management of the base telephone system will also demand careful, skillful planning and execution of his or her responsibilities by the base telecommunications manager in order to keep track of the system in the complex industry environment of the 1980's. As the scope of responsibility of the military base telecommunications manager broadens, the need for sound day-to-day management to ensure a high level of service becomes increasingly critical. Over and above the procurement of hardware, services, and maintenance, the military base telecommunications manager must have access to complete documentation for his or her system, and must provide users with a set of well-defined, yet simple, procedures for use of the system.

Many other management issues can be raised and will need to be resolved in order to ensure productive management. For example, in the future, special (dedicated) circuits between states will be subject to regulation by at least two public utility commissions and the FCC. The telecommunications manager will need to be aware of what regulating agencies will be governing the circuits serving the base and any special requirements the agencies may impose.

Quality of services has been worse when AT&T Bell System companies had to deal with independent companies such as GTE or MCI. The experts do not agree whether this situation will improve or will get worse after divestiture (it is unclear whether reduced reliability was due to overtaxing facilities, inferior equipment, or inferior service from the Bell System companies), but this is a potentially serious problem which the telecommunications manager must be aware of and must monitor closely.

Technical standards will probably be less stringently followed, presenting potential large headaches for the telecommunications manager.

One important unresolved legal issue which may have great impact on how the telecommunications manager manages the base telecommunications system is whether or not graduates of military technical schools qualify under FCC Rules and Regulations, Part 68, to provide the required affidavit that installations of key systems, PBX's and similar, more complex systems comply with Part 68 [Ref. 49].

D. THE FUTURE OF REGULATION

The military base telecommunications manager must continue to study the telecommunications industry and to keep himself or herself abreast of the developments both within and without the industry. Some tentative predictions

can be made on the basis of previous history about the future activity of governmental regulatory agencies, the future feints and jabs within the industry. and how all of the above will continue to keep the user's world in a state of flux.

The attempt by Representative Timothy E. Wirth, Head of the House Telecommunications Subcommittee, to revise the 1934 Communications Act died this past summer due to parlimentary tactics by supporters of AT&T. However, the bill of Senator Robert Packwood, S.898, had passed the Senate and Congressional revision of the 1934 Communications Act is still highly probable. It is not at all unlikely that the Bell System's competitors will again soon be besieging Congress and the FCC to protect them against AT&T.

The FCC continues to take a hands-off approach. For example, it has refused to impose regulations on direct satellite-to-home broadcasting in order to allow this service to enter the market sooner and to allow costs to be minimized [Ref. 27: Forward, p. 3].

In April 1980, the FCC proposed to eliminate restrictions on the resale and shared use of services of international common carriers and to allow COMSAT to deal directly with so-called end users, and not just with common carriers [Ref. 27].

This set of domestic and international common carrier decisions and proposals indicates that the Commission is trying to deregulate many competitively-supplied services regardless of the fact that they may have been treated legally as common-carriers-provided services in the past.

If the trend towards deregulation continues, long-distance rates may also be deregulated. If this should be the case, AT&T may argue that ABI's status as a fully separated subsidiary is no longer necessary since the possibility of subsidizing an unregulated company with the

profits from a regulated industry will no longer be an issue. Unless competition is able to make significant inroads into the dominance of AT&T in the long-distance market, and is able to keep ABI from dominating the equipment and enhanced services markets, the prospect of AT&T emerging as a completely unregulated monopoly seems very real indeed [Ref. 32: p. 116]. At the very least, freed from the need to subsidize the local networks, the Bell System Long Lines Division should be in a position where it may quite well drive its competitors out of business in short order.

The state public utilities commissions will have to act very responsibly for the next several years, or they may see services deteriorate as the local companies attempt to operate under their new structure with no "deep pocket" available to bail them out of trouble.

However, it should be pointed out that many in the industry have already begun their plans for when the pendulum begins its inevitable return swing. In fiscal year 1983, MCI intends to spend more than half of its expected one billion dollars revenue on plant expansion. Larry Kampwirth, MCI's Chicago branch manager has stated that it is his belief that, "The day is coming when resale no longer will be allowed. Resale is not forever, just as TELPAK was not forever, and those who continue to build their networks will remain" [Ref. 51].

One issue which still remains very clouded is who will pay for access charges for long distance services (interstate and inter-LATA), and how much will they be. Representative Wirth has indicated the magnitude of the potential effect of this change in billing structure: "...the average bill is $10, and under the FCC plan (to have customers pay the access charge) an access charge could be $7" [Ref. 52: p. 23]. (The FCC may select to phase in access charges over a long period to mitigate their effect.)

If, as presently appears to be the case, users will pay the access charges, they will undoubtedly be looking about for alternatives. When this issue was brought up at a press conference following the initial announcement of the AT&T/DOJ Consent Agreement, both Charles Brown, the Chairmam of AT&T, and William Baxter, the Assitant Attorney General, warned that if access charges were set at unreasonably high levels, major business telephone users and long distance companies would establish alternatives that would bypass the local telephone networks entirely. "The very simple economic and technological currents will be bound to happen," Mr. Brown said. "I'm talking about antennas on rooftops. I'm talking about cables, microwave and cellular radio which will go directly to customers and bypass the local plant if it costs too much to connect to it" [Ref. 53].

E. THE FUTURE OF THE TELECOMMUNICATIONS INDUSTRY

Within the telecommunications industry itself, many firms are rushing to fill the vacuum which will be left by the end of the vertical integration of the Bell System. In mid-1983 (unless the FCC or DOJ intervene) GTE will acquire all the stock of Southern Pacific's communications and satellite subsidiaries including the SPRINT long distance service. The chairman of MCI Telecommunications Inc. has challenged this entry of GTE into the long distance business on antitrust grounds and vows to fight it "all the way" [Ref. 54].

Some industry participants are convinced that there will be many forthcoming cooperative ventures and mergers. In August, MITEL Corp., the Canadian maker of PBX systems, joined with satellite equipment maker, Scientific Atlanta, Inc., to design, make and sell private communications

networks; and in early January, 1983, Scientific Atlanta, Inc., reported that it had completed acquisition of Digital Video Systems, Inc., Toronto, a communications equipment maker. Also last summer, RCA Corp. agreed to acquire Cylix Communications Network, Inc., to enter the U.S. data communications business. Most customers, "...don't want to buy piece parts and put the system together themselves," explains William R. Becklean, an analyst with Kidder, Peabody and Company [Ref. 55]. The industry is tooling up to offer package deals and complete systems.

F. CONCLUSION

If this paper has raised more questions with the reader than it has answered, then it has been successful. Recognizing that the answers which were acceptable in the past are no longer good enough, and gaining insights into asking the right questions is the first step that must be taken by the military base commander and the military base telecommunications manager operating in an increasingly complex telecommunications environment.

APPENDIX A

TELECOMMUNICATIONS PUBLICATIONS

Administrative Management, Geyer-McAllister Publications, Inc., New York, N.Y. 10010.

Bell Laboratories Record, Bell Telephone Laboratories, Inc., 600 Mountain Ave., Murray Hill, N.J. 07974.

Business Communications Review, 800 Enterprise Drive, Oak Brook, IL. 60521.

Canadian Interconnection, Tele-Connect Publications, 150 Metcalf Street, Ottawa, Ontario K2P1P1.

Communication Engineer and Management, Telephony Publishing Corporation, 1900 West Yale, Englewood, CO. 60604.

Communications News, Communications News Publishing Company, 402 West Liberty Drive, Wheaton, IL. 60187.

Communications User, The, Communications Trends, Inc., 181 S. Franklin Ave., Valley Stream, N.Y. 11581.

Computer Decisions, Heyden Publishing Company, 50 Essex St., Rochelle Park, N.J. 07662.

Computerworld, 797 Washington Street, Newton, Massachusetts 02160.

Data Communications User, Communications Trends, Inc., 181 S. Franklin Ave., Valley Stream, N.Y. 11581.

Data Dynamics, North American Publishing Co., 134 13th Street, Philadelphia, PA. 19107.

Datamation, Technical Publishing Company, 1301 S. Grove Ave., Barrington, IL. 60010.

Electronics, McGraw-Hill Publishing Company, 1221 Avenue of the Americas, New York. N.Y. 10020.

I/C Communications, P.O. Box 62, East White Plains, N.Y. 10604.

Infosystems, Hitchcock Publishing Company, Hitchcock Building, Wheaton, IL. 60187.

Interconnection, 37 West 57th Street, New York, N.Y. 10019.

Microwave Systems News, Weber Publications, Inc., 3921 East Bayshore Road, Palo Alto, CA. 94303.

Modern Data, Modern Data Services, Inc., 3 Lockland Ave., Farmingham, MASS. 01701.

Public Utilities Fortnightly, Public Utility Reports, Inc., 1828 L Street, N.W., Washington, D.C. 20036.

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Sound and Communications, Sound Publishing Company, 150 East 37th Street, New York, N.Y. 10016.

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APPENDIX B

A GUIDE FOR REVIEWING ECONOMIC ANALYSIS

A. The Objective, Assumptions and Alternatives

1. Is the problem stated the real problem?
2. Are all reasonable assumptions identified and explained?
3. Are assumptions too restrictive? Too Broad?
4. Are intuitive judgments identified as such? Are uncertainties treated as facts? Can the facts be verified?
5. Are any feasible alternatives omitted?
6. Are the alternatives well defined and discrete? Do they overlap?

B. The Benefit Determination

1. Does the analysis ignore some portion of total output?
2. Were the criteria used to measure benefits justified by the context of the study?
3. Was the benefit, in fact, unmeasurable? Has there been a rational assessment of non-quantifiable factors?
4. Was expert opinion used? Were these experts properly qualified?

C. The Cost Estimate

1. What costing method was used? Is it appropriate?
2. Are all relevant costs included? Are directly related support and training costs included?
3. Does the study indicate why certain costs were considered relevant and others not?
4. Are sunk costs excluded?

5. Are the sources of cost data included? Are they Accurate?
6. Are the cost estimating relationships valid, if the parametric method was used? Are extrapolations used without proof?

D. Selecting From Alternatives

1. Are the recommendations logically derived from the material?
2. Is interference from co-extensive or parallel operations ignored?
3. Are the recommendations feasible in the real world of political, cultural, or policy considerations?
4. Are the recommendations intuitively satisfying and supportable? Should "a fortiori" analysis be conducted in favor of a certain alternative?
5. Are the recommendations based on significant differences between the alternatives?
6. Is an uncertainty analysis needed to see how the analysis would change under diffenent assumptions? Were the methods and sources of the study adequately documented?
7. Do benefits exceed costs for alternatives considered?
8. Were present value estimates used?
9. Are cost factors current and supportable?

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